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WILLIAM GRAY,
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THE
ART OF TRAVEL;

OR,

SHIFTS AND CONTRIVANCES AVAILABLE IN
WILD COUNTRIES.

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AUTHOR OF "THE EXPLORER IN TROPICAL SOUTH AFRICA."

Second Edition, Revised and Enlarged,
WITH MANY ADDITIONAL WOODCUTS.

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PREFACE.

THIS volume is intended as a Manual to all who may have to "rough it," whether they be travellers, missionaries, emigrants, or soldiers.

A First Edition was published about a year since, and the present one will be found by the reader to be carefully revised, fuller of information, and more copiously illustrated.

I planned the work when exploring South Africa in 1850-51; and since my return to England, my own stock of experiences has been steadily increased by those of other travellers, which I have made a point of re-testing, so far as I could find opportunity.

In it are included the experiences, not alone of one kind of country, but those of the Bush, the Desert, the Prairie, the Water-side, and the Jungle; and the whole is arranged in a systematic manner, as a book of ready reference.

I am convinced that this Art of Travel, or of Campaigning, admits of being taught, here in civilised England, partly by illustrated Lectures, such as I am endeavouring to establish in the Camp at Aldershot, with the aid of the military authorities, and partly by a small degree of field practice, and causing the rude handicrafts it requires to be regularly learnt. Two hours a-day for three months would go very far, and the

cost of raw materials to work upon need not, I believe, exceed a shilling per lesson for each person. It therefore seems to me, though perhaps I may be considered an enthusiast by many, that every intelligent youth who seeks a commission in the army, or to become an emigrant, or a missionary, would find his time and money well spent in learning to use the axe, saw and chisel, the sail needle, the cobbler's awl, the blacksmith's hammer, and the tinsmith's soldering iron, together with the greater part of the many bush manufactures and makeshifts of which this volume treats. I am sure that a course of these subjects steadily pursued, under the eyes of competent instructors, would teach the rudiments of the arts of travelling and campaigning in a sounder way than years of untutored experience in the open field.

To conclude, I sincerely trust that I may continue to be favoured by my readers with such remarks, sketches, and corrections, as would appear to them likely to add to the value of the work. I hope I have given sufficient assurance, both that the experiences of others are highly valued by me, and also that I am most anxious to test them thoroughly and to turn them to account.

Communications may be addressed to me—"Care of Mr. MURRAY, 50, Albemarle Street, London."

FRANCIS GALTON.

January, 1856.

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ART OF TRAVEL.

WATER.

- | | |
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putrid, or salt. | § 10. Small Water-vessels. |
| | § 11. Additional Remarks. |

As it is the daily care of an explorer to discover water for himself and his caravan, it will be proper to begin this book by describing the indications which ought to guide him in his search for it.

§ 1. WHERE TO LOOK FOR WATER.—For many days after there has been rain, water is sure to be found among mountains, however desert may be their appearance; for not only does more wet fall upon them, but the fact of there being mountains ensures a more perfect drainage; and long after the ravines and stream beds are quite dry, puddles and cups-full of water will be found here and there along their courses, in holes and chinks and under great stones, which together form a sufficiency, and a sponge tied to the end of a stick will do good service in lapping these up.

But for the most part, a traveller in an arid land that is visited by occasional showers, finds his supplies in ponds

made by the drainage of a large extent of country, or else in pools left here and there along the bed of a partly dried-up watercourse, or, lastly, in fountains. And when the dry season of the year has advanced, and the water has disappeared from the surface, there remains no alternative but to dig wells where the pools formerly lay. Spots must be sought for where the earth is still moist; or, failing that, where birds and wild animals have lately been scratching, or where gnats hover in swarms. It is usual, when no damp earth can be seen, but where the place appears likely to yield well-water, to thrust an iron ramrod down into the soil, and if it bring up any grains that are moist, to dig.

In searching the beds of partly dried-up watercourses, the fact must never be forgotten, that it is especially in little tributaries, at the point where they fall into the main one, that most water is to be found; and the most insignificant of these should never be overlooked. Again, where a river-bed has been long followed by a traveller, and a constant supply of pool or well water found along its bed,—say at every 2 or 3 hours' journey, then, should this river-bed appear to lose itself in an arid plain, there is no cause of being disheartened; for on travelling further on, it will be sure to be found again, as those plains are always green and grassy where such watercourses entirely disappear.

Fresh water is frequently to be found under the very sands of the sea shore, whither it has oozed down, underground, from the upper country. In very many places along the skirt of the great African desert it is to be found by digging two or three feet.

Scanty wells in hot dry climates should be bushed over when not in actual use, to check their evaporation.

Fountains are godsend; they occur unexpectedly, but are

observed to be far more frequent and more abundant in districts composed of limestone rocks than in any others; and where these crop out in the midst of sand deserts, a careful look-out should be kept for signs of water. In granite and other primary rocks many, but small, springs are usually seen.

§ 2. TO KNOW WHEN WATER IS NEAR AT HAND.—Vegetation is a deceitful guide, unless it be luxuriant, or when such trees are seen as are observed usually to grow near water in the particular country visited, as the blackthorn-tree in South Africa, and the gum-tree in Australia. Birds—as water-fowl, parrots, and the diamond bird; or animals—as baboons, afford surer signs; but the converging flight of birds, or the converging fresh tracks of animals, is the most satisfactory of all. It is about nightfall that desert birds usually drink, and hence it often happens that the exhausted traveller, abandoning all hope as the shades of evening close in, has his attention arrested by flights of birds that give him new life, and tell him where to go. In tropical countries that have rainy and dry seasons, it must be recollected that old paths of men or wild animals only mislead; they go to dry ponds that were full at the time they were trodden, but have since been abandoned on becoming exhausted.

From the number of birds, tracks, and other signs, travellers are often pretty sure that they are near water, but cannot find the spring itself. In this case the party should at once be spread out as skirmishers, and the dogs cheered on.

There is great instinct shown in discovering water—dogs find it out well, and the fact of a dog looking refreshed, and, it may be, wet, has often and often drawn attention to a water-pond that would otherwise have been overlooked and passed by. Cattle are very uncertain in their instincts. Sometimes oxen go for miles and miles across a country unknown to

them, straight to a pond of water; at other times they are most obtuse. Mr. Leichardt, the Australian traveller, was quite astonished at their stupidity in this respect.

§ 3. OCCASIONAL SUPPLIES FROM RAIN, DEW, ETC.—A shower will yield a good supply—the clothes may be stripped off and spread out, and the rain-water sucked from them; or a cloth or blanket may be made fast by its four corners, in expectation of a coming storm, and a stone or a quantity of bullets thrown in the middle of it, which will cause the water that it receives to drain to one point, and trickle through it, down into a cup or bucket set below. An umbrella, reversed, will catch water; but the first drippings from clothes that have been long unwashed, as from a mackintosh cloak, are intolerably nauseous and very unwholesome.

It must be remembered that thirst is greatly satisfied by the skin being wetted, and, therefore, that it is well for a man suffering under thirst, to strip to the rain. Lives of sailors have more than once been saved when turned adrift in a boat, by bathing frequently and keeping their clothes damp with salt-water. However, after some days, the nauseous taste of the salt-water is very perceptible in the saliva, and at last becomes unbearable; such, at least, was the experience of the surgeon of the wrecked “Pandora.”

Dew-water is abundant near the sea-shore, and may be collected in the same way as rain-water. The store-house at Angra Pequena, in 1850, was entirely supplied by the dew-water deposited on its roof. The Australians who live near the sea go about the bushes with a great piece of bark and a wisp of grass, and brush the dew-drops from the leaves down into it, collecting in this way large quantities. Captain Eyre used a sponge, and appears to have saved his life by its use.

There are other sources of fluid which may be mentioned, for they are resorted to in emergencies—as the contents of the paunch of an animal that has been shot. This is frequently drunk by Europeans, as well as by natives in South Africa, when parched with thirst after a long foot chase. The taste is like sweet wort. Mr. Darwin writes of people who, catching turtles, drank the water that was found in their pericardia, and which was quite pure and sweet. Many roots exist from which both natives and animals obtain a sufficiency of sap and pulp to take the place of water. The traveller should acquaint himself with those peculiar to the country that he visits, such as the roots which the Eland eats, the bitter water-melon, &c.

§ 4. PRECAUTIONS AGAINST THIRST.—Enjoin on yourself and others to “drink well before starting in the morning, and to drink nothing all day till the halt; to keep the mouth shut; to chew a straw or leaf; or, Arab-like, to keep the mouth covered with a cloth; for all these are helps to prevent suffering from extreme thirst. Tying a handkerchief, well wetted in salt water, round the neck, allays thirst for a considerable time.” (Sir James E. Alexander.) I have already mentioned that people may live long without drinking, if they have means of keeping their skin constantly wet with salt or otherwise undrinkable water.

§ 5. TO PURIFY WATER THAT IS MUDDY, PUTRID, OR SALT.—With muddy water, the remedy is to filter, and to use alum, if you have it. With putrid, to boil, to mix with charcoal, or expose to the sun and air; or, what is best, to use all three methods at the same time. With salt water, nothing avails but distillation.

Muddy water.—When at the watering-place there is nothing but wet sand, take a good handful of grass, and tie it

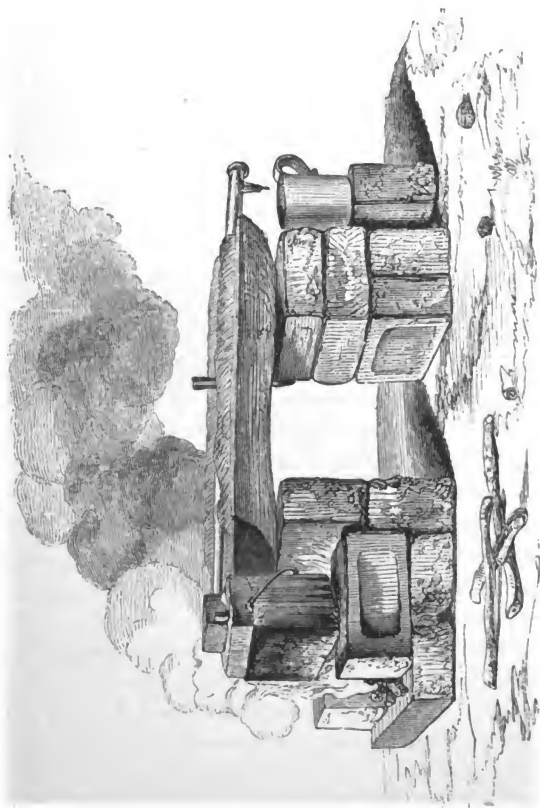
roughly together in the form of a cone, 6 or 8 inches long; then dipping the broad end into the puddle, and turning it up, a streamlet of partly-filtered water will trickle down through the small end. This excellent plan is used by the Northern Bushmen—at their wells quantities of these bundles are found lying about. (Andersson.) Otherwise, drink through your handkerchief—either put it over the mouth of your mug, or else throw it on the gritty mess as it lies in the puddle, and suck through. For a copious supply, the most perfect plan, if you have means, is to bore a cask full of auger-holes, and put another small one, that has had the bottom knocked out, inside it, then fill up the space between the two with grass, moss, &c. Now sinking the whole in the midst of the pond, the water will filter through the auger-holes and moss, and rise up clear of, at least, weeds and sand, in the inner cask, whence it can be ladled. With a single cask, the lower parts of the sides may be bored, and alternate layers of sand and grass thrown in, till they reach up above the holes; through these layers the water will strain. Or any coarse bag that is kept open with hoops, made on the spot, may be moored in the muddy pool, by having a heavy stone put inside it, and will act on the same principle, but less efficiently than the casks. Sand, charcoal, sponge, and wool, are the substances most commonly used in filters: peat charcoal is excellent. Turbid water is also, in some way as yet insufficiently explained, made clear by putting a piece of alum into it; it appears to unite with the mud, and to form a clayey deposit; and, independently of this, to have effect upon organic matters. No taste of alum remains in the water, unless it has been used in great excess. Three thimblesfull of alum will clarify a bucketful of turbid water. It is generally used in India.

Putrid water should always be boiled together with charcoal or charred sticks before drinking it, as low fevers and dysenteries too often are the consequences of its being used indiscreetly, but the charcoal entirely disinfects it; bitter herbs, if steeped in it, or even rubbed well about the cup, are said to render it less unwholesome. The Indians plunge hot iron into putrid and muddy water.

Distilling requires a good supply of fuel, which is too often deficient where there is no fresh water. The simplest still is to light a fire among stones near a hollow in a rock that is filled, or can be filled, with the salt water, then taking a hot stone, to drop it in; the water will hiss and give out clouds of vapour, much of which may be collected in a cloth and wrung from it, or sucked out of it. In the same way a pot on the fire may have a cloth stretched over it to catch the steam. There is an account of the crew of the *Levant* packet, which was wrecked near the Cosmoledo Islands, who supplied themselves with fresh water by means of distillation alone, and whose still was contrived with an iron pot and a gun-barrel, found on the spot where they were wrecked. They procured, on an average, 60 bottles, or 10 gallons, of distilled water in each 24 hours. "The iron pot was converted into a boiler to contain salt water; a lid was fitted to it out of the root of a tree, leaving a hole of sufficient size to receive the muzzle of the gun-barrel, which was to act as a steam-pipe; the barrel was run through the stump of a tree, hollowed out in the middle, and kept full of cold water for the purpose of condensation; and the water so distilled escaped at the nipple of the gun-barrel, and was conducted into a bottle placed to receive it." Some thought or cleverness is required to build a good furnace, or fireplace, on which to place the pot. It is necessary that the fire should act to the best advantage, and

burn fiercely, or the pot will never boil fast enough to distil a sufficiency.

The sketch is taken from a model which I made with a soldier's mess-tin. I may remark that there is nothing in the arrangement which would hurt the most highly-finished gun-



barrel, and that the trough which holds the condensing water may be made with canvas or even dispensed with altogether. In default of other tubes, a reed or one of the long bones either of an animal or of a wading bird will be found better than nothing.

§ 6. TO DIG WELLS.—In default of spades, water is to be dug for with a sharp-pointed stick: take this in both hands, and holding it upright like a dagger, stick and dig it about



in the ground, then clear out the loose earth with the left hand. Continue thus working with the stick and hand alternately, and a hole as deep as the arm is easily burrowed out. In making a larger well, the earth must be loosened in precisely the same way, and handed up to the surface, and carried off by means of a bucket or bag, in default of a shovel and wheelbarrow.

After digging deeply, the sand will often be found just moist, no water actually lying in the well ; but do not, there-



fore, be disheartened ; wait awhile, and the water will collect. After it has once began to ooze through the sides of the well, it will continue to do so much more freely. Therefore, on arriving at night, with thirsty cattle, at a well of doubtful character, it should be deepened at once by torch-light, and then enough water will have time to collect for the cattle, who can be watered in the early morning, and be sent to feed before the sun is hot.

I am indebted to a correspondent for an account of a method employed in the plains of the Sikhim Himalaya for digging deep holes. The natives take a bamboo, say three inches in diameter ; they cut it just above one of the knots, and then split the wood up to the next joint in about a dozen places. The grass is then torn away, and this instrument is worked vertically up and down, with both hands. The sandy

soil soon gets up into the hollow of the bamboo and spreads out the blades, as shown in the sketch at the bottom of the opposite woodcut. The bamboo is then withdrawn, this plug of earth is shaken out, and it is worked up and down as before. Holes 10 feet deep and 6 inches wide can be made, as I am informed, in this way.

In sandy soils, the sides of the well are so often falling in, that it is advisable often to sink a cask in the soil. The following extract from Bishop Heber is so suggestive, that, though hardly within the scope of my subject, I cannot reject it.

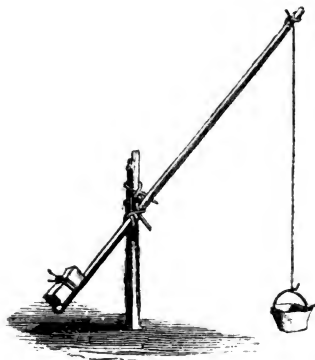
Wells (Bhurtpoor, India).—"The wells of this country, some of which are very deep, are made in a singular manner. They build a tower of masonry of the diameter required, and 20 or 30 feet high from the surface of the ground. This they allow to stand a year or more, till its masonry is rendered firm and compact by time; then they gradually undermine it, and promote its sinking into the sandy soil, which it does without difficulty, and altogether. When level with the surface, they raise its walls higher; and so go on, throwing out the sand and raising the wall, till they have reached the water. If they adopted our method, the soil is so light, that it would fall on them before they could possibly raise the wall from the bottom; nor, without the wall, could they sink to any considerable depth."

§ 7. TO WATER CATTLE FROM WELLS.—Let one man stand in the water, or just above it; another 5 feet higher; and again another, if the depth of the well requires it. Then let the lowermost man dip a bucket in the water, and pass it from hand to hand upwards. In this way, watering cattle proceeds very quickly. The top man pours the water into a trough, out of which the cattle drink. This trough may be simply a ditch scratched in the ground, and with a piece of canvas

thrown over it, should the soil be sand, to keep the water from being lost before the cattle have time to drink it. Thus Colonel Eyre speaks of watering his horse out of his black servant's duck frock.

The drove of cattle should be brought up to 60 yards from the watering-place; then three or four should be driven out—they will run at once to the water. After they have drunk, drive them to one side, and let another three or four take their place, and so on; keeping the two droves quite distinct—those that have drunk, and those that are waiting to drink. They will drink at the rate of one per minute; sheep and goats drink very much faster. Never let the cattle go in a rush to the well, else they will stamp it in, get no water, and do much damage. Light gutta-percha buckets are very useful, and so are baskets with oilcloth inside them.

A pole and bucket is a very convenient way of raising water from 4 to 12 feet. The bucket may be made of anything—canvas, basket-work, leather, or wood; leakage is of little consequence, even though it is very considerable. This

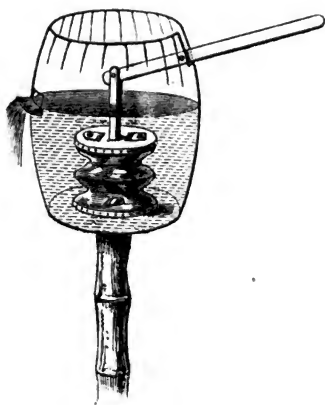


contrivance is used over almost the whole globe—less in England than elsewhere; it is very common where long poles can easily be obtained, as in fir forests.

The Tartars sometimes draw water from their wells, of 150 feet deep and upwards, by a rider harnessing the bucket-rope to his horse, and galloping him off to a mark that tells the proper distance, and so draws up the bucket. Their ropes are of twisted hair, and run over a smoothed stone or log of wood.

An excellent pump is used by the Arabs in Algeria; a piece of leather (or waxed canvas) is stretched round hoops, and at top and bottom round circles of wood also. In these circles are holes covered with valves of leather, opening upwards. The lower circle is nailed to the bottom of a tub, and the hole in it corresponds with the feed-pipe; the upper circle is attached to the pump-handle.

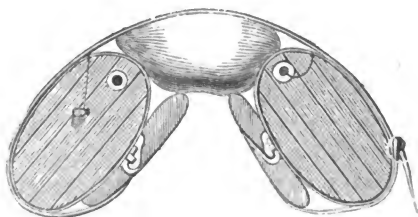
When this leather pump-barrel is collapsed, the water flows out through the upper valve into the barrel around it;



when expanded, water is sucked up through the tube, and an equal quantity displaced in the barrel, which pours out into the trough. A bag would do as well as a tub to hold the water which surrounds the pump-barrel; but, without either one or the other, the pump-barrel must be air-proof as well as water-proof.

The action of this pump is marvellously perfect. It attracted much attention in the French Exhibition of 1855.

§ 8. TO CARRY A SUPPLY OF WATER ON PACK-SADDLES.—Small barrels, flattened equally on both sides, so that their tops and bottoms are of an oval and not a circular shape, are most convenient for carrying water in pack-saddles across a broken country. They are very strong indeed, and require no particular attention, while bags suffer from thorns, and natives secretly prick them during the march, that they may suck a draught of water. These kegs should not exceed 22 inches in length, 10 in extreme breadth, and 7 in extreme width; a cask of which measurements would hold about 40 lbs. weight of water, and its own weight might be 15 lbs. As the water is expended, it will be easy to replace the diminished weight by putting on a bag from one of the other packs. Before starting away into the bush, these kegs should be satisfactorily fitted and adjusted to the pack-saddle that is intended to carry them, in such a way, that they may be packed on to it with the



least possible trouble. A couple of leather or iron loops fixed to each keg, and made to catch on to hooks which are let flush into the sides of the pack-saddles, will effect this.

The sketch represents a section of the pack-saddle at the place where one of the hooks is situated on either side, but the front of the kegs themselves, and not their section, is given. Above and between the kegs lies a bag, and a strap passing from the near side of the saddle goes over the whole burden, and is buckled to a similar short strap on the other side. It is of importance that the bung-hole should be placed even nearer to the rim than where it is drawn, for it is necessary that it should be convenient to pour out of and to pour into, and that it should be placed on the highest part of the keg, both when on the beast's back and also when it stands on the ground, lest water should leak and be lost. According to the above plan, when water is ladled into it, the rim keeps it from spilling; and in pouring out water, the rim acts as a spout.

In making the bung-hole itself, a metal plate, with a screw-hole in it, is firmly fixed in the face of the cask; into this a wooden stopper, bound with iron, is made to screw (natives would probably steal a metal one). The stopper has a small head and a deeply-cut neck, by which it is tied to the cask, and its body has a large hole bored in it, which admits of a stick being put through, to prize it round, if ever it becomes jammed. A spigot, to screw into the bung-hole on arriving at camp, might be really useful; but if used, a gimlet-hole must be bored in the cask to act as an air-vent. A large tundish is very convenient, and a spare plug might be taken; but a traveller, with a little painstaking, could always cut one with his own knife sufficient to screw in firmly,

and to retain the water, if it had a bit of rag wrapped round it. A roll of rag alone will suffice.

A flexible tube of some kind, whether of India-rubber, gutta-percha, or, still better, mackintosh, strained over rings, would be very valuable as a syphon; both for filling large kegs out of buckets and for emptying them again. Vulcanised India-rubber becomes rotten after short use, and gutta-percha will stand no extremes of temperature.

§ 9. TO CARRY A SUPPLY OF WATER IN WAGGONS.—The most efficient way of carrying a large supply of water upon wheels has yet to be determined. The jolting and straining of a waggon is, at times, terrible, and it stands to reason, that a large solid tank must require to be made of excessive substance and weight to resist it. I am, therefore, inclined to recommend square bags of mackintosh, or even canvas (p. 20), fitting into square compartments, in large panniers, arranged just like those in a bottle-basket. The basket-work would give protection against blows and the jolting together of packages, and it would yield without harm to a strain, and the bags would yield also. Moreover, water churns about less in half-empty bags than in half-empty barrels. No particular strength of materials would be required in making these bags; their mouths should be funnel-shaped, wide open above, for the convenience of pouring in water, and also because a string, tied round the neck to secure it, would never slip off. The bags should have loops along their sides, through which a strap passing underneath might be run, to give a good hold for lifting them up.

The question remains, of what size would it be the most convenient to make them? They could easily be filled as they lay in their compartments, and would only require to be lifted out in order to empty them; there would, therefore,

be no objection to their holding a considerable weight of water. An India-rubber tube as a syphon would be here particularly useful.

All things considered, I should recommend their being fitted to compartments measuring 18 inches deep, and 10 inches square; they would then each hold about 60 lbs. of water. A pannier not much exceeding 30 inches long, by 20 broad, and 18 deep, would hold six of these bags, or 360 lbs. weight of water in all; and two such panniers would be ample for exploring purposes; the weight of the panniers and bags together, is at the rate of 6 lbs. for each compartment. In fact, the weight of these water-vessels is not more than 10 per cent. of that of the water which they carry. It might be very proper to vary the contents of some few of the compartments, by way of experiment, putting, for instance, two or even three small bags into one, and tin cases into a few others, instead of the large bags. These panniers, with the bags inflated and connected together by a stage, would form an excellent and powerful raft. If secured within a waggon about to cross a deep river, they would be ample enough, in all ordinary cases, to cause it to float and not to sink to the bottom.

Captain Sturt, when he explored in Australia, took a tank in his cart, which burst, and, besides that, he carried casks of water. By these he was enabled to face a desert country with a success which no traveller before had ever attained to. For instance, when returning homewards, the water was found to be drying up from the country on all sides of him. He was at a pool, and the next stage was 118 miles, at the end of which it was doubtful if there remained any water. It was necessary to send to reconnoitre, and to furnish the messenger with means of returning should the pool be

found dry. He killed a bullock, skinned it, and filling the skin with water (which held 150 gallons), sent it by an ox-dray 30 miles, with orders to bury it and to return. Shortly after he dispatched a light one-horse cart, carrying 36 gallons of water; the horse and man were to drink at the hide, and go on. Thus they had 36 gallons to supply them for a journey of 176 miles, or 6 days, at 30 miles a day, at the close of which they would return to the ox-hide—sleeping, in fact, 5 nights on 36 gallons of water. This a hardy, well-driven horse could do, even in the hottest climate.

§ 10. SMALL WATER-VESSELS.—No expedition should start without being very adequately supplied with these, for no ingenuity in the bush can make anything so efficient as casks, tin vessels, or mackintosh bags. People drink excessively in hot, dry climates, as the evaporation from the skin is enormous, and must be counterbalanced; the daily ration of a European in these is at least two quarts a day. To make an exploring expedition efficient, there should be means of carrying at least half a gallon of water for each white man, and in unknown countries this quantity should invariably be carried on from every watering place, so long as means can possibly be obtained of carrying it; and should be served out thus:—two quarts the first day, in addition to whatever private store the men may choose to carry for themselves; a quart and a half during the second day; and half a quart on the morning of the third, which will carry them through that day without distress. Besides water-vessels sufficient for carrying all this, there ought to be means of leaving water buried in the ground as a store for the return of a reconnoitring expedition; and each man should be furnished with a tin canteen holding a quart, of this shape, which, whether empty or full, he should have the

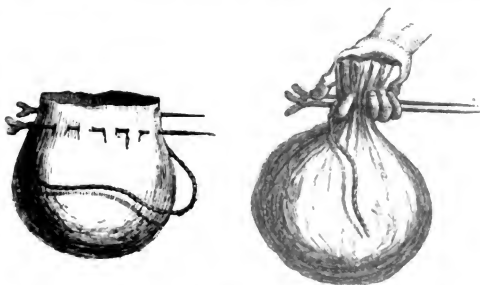


charge of. The Arabs use a porous leather flask called a Zemsemyah, which is hung on the shady side of the camel, and by evaporation keeps the water it contains deliciously cool. It is rather wasteful. Canvas bags do as well.

Native vessels.—Vessels for carrying water are made as follows :—

From the raw or dry skins of animals, which should be greased down the back.

The paunch, the heart-bag (pericardium), the intestines, and the bladder. When used they should have a wooden skewer run in and out along one side of their open mouths, by which



they can be carried, and a lashing passed round under the skewer to make all tight. The Bushmen do this. The water oozes a little through the sides, and by its evaporation the contents are kept very cool. Another plan is, after having tied the length of intestine at both ends, to roll it up in a handkerchief and wear it as a belt round the waist. The fault of these bags, besides their frailty, is, that they become putrid after a little use.

The bark of a tree, either taken off in an entire cylinder, and having a bottom fitted on, or else a knot or excrescence

being cut off the outside of a tree, and its woody interior scooped out.

Soft wood hollowed out into buckets.

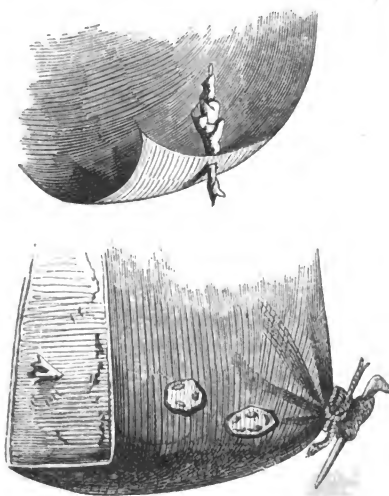
Calabashes and other large fruits, cocoa-nuts, &c.

Ostrich eggs.

Canvas bags, smeared with grease on the outside, become perfectly waterproof after a short soaking.

Baskets with oiled cloth inside make efficient water-vessels, and are in use in France as firemen's buckets.

§ 11. ADDITIONAL REMARKS.—When carrying water in buckets, put a wreath of grass, or something floating on the top of the water, to prevent it splashing; and also make a hoop, inside which the porter walks, while his laden hands rest on



its rim, whose office it is to keep them wide from his body, and prevent the buckets from knocking against his legs.

If a water-vessel becomes leaky, it should be caulked up by stuffing a rag, a wedge of wood, a tuft of grass, or anything into it, and then greasing or waxing it over. A larger rent must be seized upon, the lips of the wound pinched up, a thorn or other spike run through the lips, and lastly a piece of twine lashed firmly round, underneath the thorn, whose office it is to keep the string from slipping off.

The Bushmen of South Africa make great use of ostrich shells as water-vessels. They have stations at many places in the desert, where they bury these shells filled with water, corked with grass, and occasionally waxed over. They thus go without hesitation over wide tracts, for their instinct of locality is so strong that they never fear to forget the spot in which they have dug their hiding-place.

It is a good rule for an explorer, that, when in an arid country he happens to come to water after not less than three hours' travelling, to stop and encamp by it; it is far better for him to avail himself of his good fortune and be content with his day's work, than to risk the uncertainty of another supply.

FIRE.

§ 1. To obtain a Spark.

§ 2. Tinder.

§ 3. To kindle a Spark into a Flame.

§ 4. Fuel.

§ 5. Camp Fires.

Although in the teeth of every precaution, fires constantly break out, yet when we want a spark, and do not happen to have our ingenious fire-making contrivances at hand, it is scarcely possible to get one. And further, though sparks, of their own accord and in the most unlikely places, too often burst out into conflagrations, yet it is a matter of no small skill and difficulty to coax a spark into a blaze.

§ 1. TO OBTAIN A SPARK.—In default of lucifer-matches, the principal means of obtaining fire are by flint and steel, a gun, or a burning-glass. Every traveller should carry about him a light handy steel, an agate, amadou, and a bundle of chips of wood, thinner and shorter than lucifer-matches, with fine points, which he has had dipped in melted sulphur, and also a small spare lump of sulphur in reserve. Cigar fusees are not worth taking in travel, as wet entirely spoils them. The cook should have a regular tinder-box, such as he happens to have been used to, and an abundance of lucifer-matches. Wax lucifers are undoubtedly better than wooden ones, for in damp weather wooden ones will hardly burn, but wax is waterproof, and independent of wet or dry. When there is nothing dry at hand to rub the lucifer-match against, in order to light it, scratch at the composition on its head

with the edge of a knife or with the finger-nail. It is a sure way of lighting it, and with care there is no need of burning the fingers.

Flint and steel.—Agate is better than flint—it makes a hotter spark. The principal tobacconists sell agates at six pence each—they are well worth buying. Quartz, and other hard stones, will just make a spark. The joints of bamboo sometimes contain enough silex to strike a light with steel.

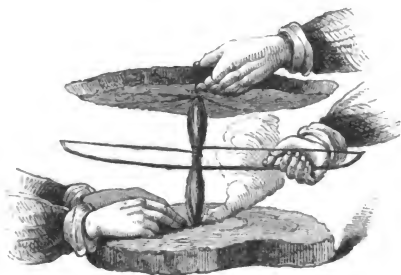
Steels can be made even by a traveller, out of common iron, by “case-hardening” (p. 140), and the link of a chain is of a good shape to be turned into a steel. The North Americans use iron pyrites to strike fire with.

Guns.—With a flint-and-steel gun, the touch-hole may be stuffed up, and a piece of tinder put among the priming powder: a light can be obtained in that way without letting it off. With a cap gun, a light may be got by putting powder and tinder round the cap outside the nipple, which will, though not with certainty, catch fire on exploding the cap. But the common way with a gun is to put a quarter of a charge of powder in, and above it, quite loosely, a quantity of rag or tinder. On firing the gun straight up in the air, the rag will be shot out lighted; you must then run after it as it falls, and pick it quickly up. With percussion-caps, gunpowder, and tinder, a light may be got on an emergency by scratching and boring with a knife, awl, or nail, at the fulminating composition in the cap till it explodes; but a cap is a somewhat dangerous thing to meddle with, as it often flies with violence, and wounds. Crushing gunpowder with sand, or among hard stones, may make it explode.

Burning-glass.—The object-glass (and indeed almost any other one) of a telescope is a burning-glass, and has only to

be unscrewed to be used. Some old-fashioned watch-glasses filled with water will answer the same purpose; if the sun is not high above head, its rays must be glittered vertically down by means of a mirror. I have read somewhere of the crystalline lens of a dead animal's eye having been used, on an emergency, with success as a burning-glass. Blackened tinder ignites in the sun much more easily than light-coloured tinder.

Fire-sticks.—The sticks that savages use require a long apprenticeship to work with, and it is not every kind of sticks that will do. But if a serious emergency should occur, it is by no means hopeless to obtain fire after the method shown in



the wood-cut. A party of men have advantages, because as the work is very fatiguing, the whole party can try in turns, and, as there is considerable knack required to succeed, it is much more probable that one man out of many should succeed, than that a single beginner should do so. One person works the "drill stick" with a rude bow, and with his other hand holds the upper piece of wood, both to steady it and to give the requisite pressure,—gentle at first, and increasing judiciously up to the critical moment when the fire is on the point

of bursting out. Another man holds the lower piece of wood, the "fire-block," to steady it, and has a piece of tinder ready to catch fire. The "fire-block" is more important than the drill-stick; any tough hard and dry stick will do for the latter, but the fire-block must be of wood with little grain, and of a middle degree of softness, and sufficiently inflammable. If very hard, the action of the drill-stick will merely dent and polish it; if very soft, it will be worn away before the friction has time to heat it sufficiently. It is not at all difficult to produce smoke with a broken fishing-rod, or ramrod, as a drill-stick, and a common wooden pill box, or tooth powder box, as a fire-block. Walnut, also, does as a fire-block, and the stock of a gun is of walnut. Deal and mahogany are both worthless for fire sticks.

It is well to notch the fire-block so that the wood dust, as it is ground away, should all run into one place: it will then glow with a smouldering heat, ready to burst out into an available flame with a little fanning, as soon as heat sufficient to ignite tinder has been attained to. Tinder is a great convenience in ensuring that the fire once obtained, shall not be lost again, but it is not positively necessary. Savages carry the drill-stick in a quiver with their arrows, and the fire-block,—a stick three inches long, and one in diameter,—as a pendant to their necklace. Most savages work by squatting down and holding the fire-block to the ground by resting their toes upon it, and twirling the drill-stick between the palms of their hands. They require no assistance, and no drill-bow, and dispense with tinder; but they practise the art all their lives.

§ 2. TINDER.—If you have a regular tinder-box, the best sort of tinder is the commonest, namely, rags of cotton or linen lighted and smothered before they are burnt to ashes. Amadou, punk, or German tinder, is made from a kind of

fungus or mushroom that grows on the trunks of old oaks, ashes, beeches, &c., and many other kinds of fungus and, I believe, all kinds of puff balls will also do. "It should be gathered in August or September, and is prepared by removing the outer bark with a knife, and separating carefully the spongy yellowish mass that lies within it. This is cut into thin slices, and beaten with a mallet, to soften it, till it can easily be pulled asunder between the fingers. It is then boiled in a strong solution of saltpetre (gunpowder in other respects useless, would do to afford the saltpetre), beaten anew, and put a second time into the solution." Touchwood is well known.

Dried cattle-dung is very useful as tinder, and there are many substances peculiar to different countries, and used by the natives in them, which a traveller ought to inform himself about.

In all cases the presence of saltpetre (p. 200) makes tinder burn more hotly and more fiercely, and saltpetre exists in such great quantities in the ashes of many plants (as tobacco, dill, maize, sunflower), that these can be used, just as they are, in place of it. Thus, if the ashes of a cigar be well rubbed into a bit of paper, they convert it into touch-paper. Gunpowder, also, of which three-quarters is saltpetre, if rubbed into paper, has the same effect; and injured gunpowder, as remarked before, will do as well for this purpose as that in the very best condition. If it be an object to prepare a store of touch-paper, a strong solution of saltpetre in water should be obtained, and the paper, or rags, or fungus, dipped into it, and hung to dry. This solution may be made by pouring a little water on a charge of gunpowder, or on the ashes above mentioned, which will dissolve the saltpetre out of them. Boiling water makes a solution forty-fold stronger than ice-cold water, and about eight times stronger than water 60°

Fahr.; and unsized paper, like that out of a blotting book, is the best suited for making into touch-paper.

§ 3. TO KINDLE A SPARK INTO A FLAME by blowing is quite an art, which few Europeans have learnt, but in which every savage is proficient. The spark should be received into a kind of loose nest of the most inflammable substances at hand, which ought to be prepared before the tinder is lighted. When by careful blowing or fanning the flame is once started, it should be fed with little bits of sticks or bark, split with a knife, or rubbed between the fingers into fibres, until it has gained enough strength to grapple with thicker ones. There is a proverb, "Small sticks kindle a flame, but large ones put it out." It is the duty of a cook, when the time of encamping draws near, to get down from his horse, and to pick up, as he walks along, a sufficiency of little bits of wood to start a fire; which he should begin to make as soon as ever the caravan stops. The fire ought to be burning, and the kettle standing by its side, by the time that the animals are caught and are ready to be off-packed.

Sulphur matches are so very useful to convert a spark into a flame, and they are so easily made, in any quantity, out of split wood, straws, &c., if the traveller will only take the trouble of carrying a small lump of sulphur in his baggage, that they always ought to be at hand. The sulphur is melted in an old spoon, bit of crockery, or bit of tin with a dent made in it, and the points of the pieces of wood dipped in the molten mass. A piece of paper held above a smouldering fire, or laid on burning tinder, will do perfectly as a make-shift instead of a spoon, since sulphur melts at a temperature very little exceeding that of boiling water. And a small chip of sulphur pushed into the cleft end of a splinter of wood makes a match of it at once.

In soaking wet weather, the little chips of dry wood, that are so essential to start a fire, are best cut with an axe out of the middle of a tree, and the fire may be started, as Capt. Murray recommends, in the frying-pan itself, for want of a dry piece of ground. In moderately wet weather, they should be looked for under large stones and other shelter. But observe what the natives do in the country in which you are travelling.

§ 4. FUEL.—There is something of a knack in finding firewood. It should be looked for under bushes; the stump of a tree that is rotted nearly to the ground has often a magnificent root, fit to blaze throughout the night. In want of firewood, the dry manure of cattle, and other animals, as found on the ground, is very generally used throughout the world, and there is nothing whatever that is objectionable in employing it. The Canadians call it by the apt name of “Bois de Vache.” In North and in South Africa it is frequently used; throughout a large part of Armenia and of Thibet they rely entirely upon it. There is a great convenience in manure fuel, because as it is only in camps that fuel is wanted, so it is precisely at old encamping places that manure is abundantly found.

Bones.—Another very remarkable substitute for firewood is bones, a fact to which Mr. Darwin was, I believe, the first to draw public attention. The bones of an animal, when freshly killed, make good fuel; and even those of cooked meat, and such as have been exposed to the air for some days, will greatly increase the heat of a scanty fire. Their smell is not disagreeable, it is simply that of roast or burnt meat. In the Falkland Islands, where firewood is scarce, it is not unusual to cook part of the meat of a slaughtered bull with its own bones. When the fire is once started with a few sticks, it

burns hotly. The flame, of course, depends on the fat within the bones, and, therefore, the fatter the animal the better fuel should we expect them to be. During the Russian campaign in 1829, the troops suffered so severely from cold, at Adrianople, that the cemeteries were ransacked for bones for fuel (Molke, *in the Appendix*).

Travellers must bear in mind that peat will burn, especially as the countries in which it is found are commonly destitute of firewood, and besides that, marshy, cold, and aguish. Charcoal is frequently carried by travellers in sacks; they use a prepared charcoal in the East, which is made in the form of very large buttons, that are carried strung together on a string.

§ 5. CAMP FIRES.—In the pine forests of the North, at winter time, it is usual to fell a large tree, and cutting it in two, to pile one piece on the other, having previously cut flat with the axe the sides that come in contact, and then notched them so as to make the upper log lay steady. The chips are then heaped in between the logs and are set fire to, the flame runs in between them, and the heat of each log helps the other to burn. It is the work of nearly an hour to prepare such a fire, but when made, it lasts throughout the night. In all cases, one or two great logs are far better than many small ones, as these burn fast away and require constant looking after. Many serious accidents occur from a large log burning away and toppling over with a crash, sending a volley of blazing cinders among the sleeping party. Savages are always getting burnt, and we should take warning from their carelessness; sometimes they find a single scathed tree without branches, and which they have no means of felling; this they set fire to as it stands, and when all have fallen off to sleep, the tree tumbles down upon them. In-

deed, savages are seldom free from scars of severe burns; they are so cold during the night that they cannot endure to be an inch further from the fire than necessary, and consequently, as they turn about in their sleep, often roll into it.

Should your stock of fuel consist of large logs and but little brushwood, keep what you have of the latter to make a blaze when you get up to catch and pack the cattle in the dark and early morning. As you travel on, if it be bitter cold, carry a firebrand in your hand, near your mouth, as a respirator—it is very comforting; then, when the fire of it burns dull, thrust the brand for a few moments in any tuft of dry grass you may happen to pass by, which will blaze up and give a new life to the brand.

If in a country where only a number of small sticks and no large logs can be collected as firewood, the best plan is to encamp after the manner of the Ovampos. These, as they travel, collect sticks, each man his own faggot, and when they stop, each takes eight or nine stones as large as bricks or larger, and sets them in a circle, and within these he lights up his little fire. Now the party make their fire-places close together, in two or more parallel lines, and sleep in between them; the stones prevent the embers from flying about and doing mischief, and also, after the fires have quite burnt out, they still continue to radiate heat.

If charcoal be carried, a small chafing-dish, or other substitute for a fire-place, ought also to be taken, together with a set of tin cooking utensils.

In boating excursions, dab a lump of clay on the bottom of the boat, beneath the fire-place, it will secure the timbers from fire. “Our primitive kitchen was a square wooden box, lined with clay and filled with sand, upon which three or four large stones were placed to form a hearth.” (Burton’s *Medinah.*)

BIVOUAC.

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| § 1. Where to seek for Shelter. | § 4. Huts, Tents, and Awnings. |
| § 2. Mattresses, Blankets, and their
Substitutes. | § 5. Tent Furniture. |
| § 3. Different ways of Bivouacking. | § 6. Rude Houses. |

The most bulky, and often the heaviest, parts of a traveller's equipment are his clothes, sleeping-mat, and blankets; neither is it at all desirable that these should be stinted in quantity, for the hardship that most tries a man's constitution, and that lays the seeds of rheumatism, dysentery, and fever, is that of enduring the bitter cold of a stormy night, which may happen to follow a trying day of extreme heat and exhaustion, or of drenching wet. After many months' travel and camping, the constitution becomes far less susceptible of injury from cold and damp, but in no case is it ever steeled to their influence. Indeed, the oldest travellers will ever be found to be those who go the most systematically and carefully to work in making their sleeping-places dry and warm. Unless a traveller makes himself at home and comfortable in the bush, he will never be quite contented with his lot, but will fall into the bad habit of looking forwards to the end of his journey, when he shall return home to civilisation, instead of complacently interesting himself in its progress. This is a frame of mind in which few great journeys have been successfully accomplished, and an explorer who cannot divest himself of it, may be sure he has mistaken his vocation.

§ 1. WHERE TO SEEK FOR SHELTER.—Study the *form* of a hare! In the flattest and most unpromising of fields, the creature will have availed herself of some little hollow to the lee of an insignificant tuft of grass, and there she will have nestled and fidgetted about till she has made a smooth, round, grassy bed, compact and fitted to her shape, where she may curl herself snugly up, and cower down below the level of the cutting night wind. Follow her example: a man, as he lies down upon his mother earth, is but a small low object, and a screen of 18 inches high will guard him securely from the strength of a storm. The great mistake of a novice lies in selecting a tree for his camping-place, which spreads out nobly above, but affords nothing but a bare stem below. It may be that as he walks



about in search of a bush, the quantity of foliage at the level of his eye, with its broad shadow, chiefly attracts him, and as he *stands* to the leeward of it, it seems snug, and, therefore, without further reflection, he orders his bed to be spread at its foot. But as soon as he lies down on the ground, the tree proves worthless as a screen—it is a roof and not a wall; what is really wanted is a dense low screen, perfectly wind tight, as high up as the knee above the ground. All additional defence is superfluous to a sleeping man. Thus, if a traveller has to encamp on a bare turf plain, he need only turn up a broad sod, seven feet long by two feet wide, and if he succeeds in propping it up on its edge, it will form a sufficient shield against the wind.

We must bear in mind that a gale never blows in a level current, but in all kinds of curls and eddies, as the driving of a dust storm, or the vagaries of bits of straw caught up by the wind, unmistakably show us. Little hillocks, or undulations, combined with the general lay of the ground, cause these eddies, and entirely divert the impact of the wind from some particular spots. These spots should be looked for; they are discovered by watching the grass, or even the sand, that lies on the ground. If the surface be still in one place, while all around is agitated by the wind, we shall not go far wrong in selecting that place for our bed, however unprotected it may seem in other respects. Indeed, it is constantly remarked that quite a slight mound or ridge will sometimes shelter the ground for many feet behind it, and an old campaigner will accept such shelter gladly, notwithstanding the apparent insignificance of its cause. A pile of saddle-bags and other travelling gear may be made into a good and snug screen against the wind, and travellers usually arrange them with that intention.

A few leafy boughs cut and stuck into the ground, with their tops leaning over the bed, and, when in that position, wattled together by other ones laid horizontally, give great protection.

A clump of trees yields wonderful shelter. The Swedes have a proverb that "the forest is the poor man's jacket." In the cruel climate of Thibet, Dr. Hooker tells us that it is the habit to encamp close up to some large rock, because a rock absorbs heat all day and parts with it but slowly during the night-time. It is, therefore, a great reservoir of warmth when the sun is down, and its neighbourhood is always coveted; and from the same cause, but acting in the opposite direction, its shadow is peculiarly cool and grateful during the heat of the day. The near neighbourhood of water is objectionable, for besides being exposed to malaria and mosquitoes, the night air is sure to be felt more cold and penetrating by its side than at one or two hundred yards' distance from it. In a broad, level plain, it is best to look out for some slight rise for an encampment, as in such places the cold is found to be less severe than on the flat itself; horses and cattle, as the night sets in, always draw up towards these rising grounds.

In Kamschatka and in Wallachia people live in underground houses, and the experience of our troops at Sebastopol is strong in their favour. They are simply large holes dug in the earth and roofed over. The bottom of a dry well, with a small fire in the middle, is a capital place for a bivouac; it can be more or less roofed over. A stony shingle makes a fine dry encamping place, and has an advantage in making it impossible for marauders to creep up unheard.

Burying oneself in sand, snow, &c. — A European can live through a bitter night, on a dry sandy plain, without any

clothes besides what he has on, if he buries his body pretty deeply in the sand, keeping only his head above ground. It is a usual habit of the naked natives in Australia to do so, and not an unfrequent one of the Hottentots of South Africa. Mr. Moffat records with grateful surprise how he passed a night, of which he had gloomy forebodings, in real comfort, even luxury, by adopting this method. In snow, it appears that people may do even more—they may bury themselves entirely, and want neither air nor warmth. I have never tried it, but the instances are numerous of people falling into snow drifts and not being extricated for many days, and when at length they were taken out, they never seem to have complained of cold, or any other sufferings than those of hunger and of anxiety. A few chill hours may be got over by nestling in among the ashes of a burnt-out camp fire. In Napoleon's retreat after his campaign against Russia, many a soldier saved or prolonged his life by creeping within the warm and reeking carcase of a newly-dead horse.

§ 2. MATTRASSES, BLANKETS, AND THEIR SUBSTITUTES.—It is a common idea among young travellers, that all the bed-clothing which they need concern themselves about is a sufficiency to cover them, forgetting that a man has an under as well as an upper side to keep warm, and must, therefore, have clothing between him and the earth as well as between him and the air. Indeed, on trying the experiment, and rolling oneself up in a single blanket, the undermost side in a cold night is by far the colder of the two; and if the ground be at all wet, its dampness penetrates through very thick substances. The object of a mattress is not alone to give softness to the bed, but to give warmth, just as much as it is that of the upper blankets to do so; and if a person lies in a hammock, with nothing but the hammock itself below, and with warm clothes

above, he will be just as much chilled as if the arrangement had been reversed, and he had lain upon warm things, with only the hammock spread out as a sheet to cover him.

“Making a mattress is indeed a very simple affair. A bag of canvas, or other cloth, being made of the size wanted, it is stuffed full of hair, wool, or cotton, and a strong stitch is put through it every few inches. The use of this is to prevent the material used from being displaced, and thus forming lumps in different parts of the bag. Straw, well knitted together, forms a good mattress, sometimes called a *paillasse*.” See *Mats*, p. 54.

Eight pounds weight of shavings make an excellent bed, and they can be cut with a common spokeshave in $3\frac{1}{2}$ hours out of a log of deal. Old cord, picked into oakum, will also make a bed.

A strip of mackintosh.—If a traveller can do so, he should make a point of having, in addition to his upper bed-clothing, a strip of mackintosh sheeting 7 feet by 4, certainly not less than 6 feet by 3, to lay first on the ground, and a light mattress stuffed with good horsehair to go over it. Every white servant in the expedition ought to be furnished with, at least, a strip of mackintosh sheeting, or, failing that, with a strip of painted canvas. This is, however, much inferior to mackintosh, as it will not fold up without cracking—it also tears easily, and is heavy. Mackintosh, of the sort that suits all climates, is invaluable stuff to an explorer, whether in the form of sheeting, coats, water-bags, swimming-belts, or inflatable boats. (*For Tarpauling*, see p. 48.)

If a traveller, as is very commonly the case, should have no mattress, he should strew his sleeping-place with dry grass, plucked up from the ground, and other warm things, imitating the structure of a bird's-nest as far as he has skill and materials

to do so. Leaves, fern, feathers, heather, rushes, flags of reeds and of maize, wood shavings, bundles of faggots, and such like things as chance may afford, should be looked for and appropriated. Over these, let him lay whatever empty bags, skins, saddle-cloths, spare clothes, &c., he may have, which from their shape or smallness cannot be turned to account as coverings in other ways, and the lower part of his bed is complete.

It gives great comfort to have scraped a little hollow in the ground, just where the hip bone would otherwise press.

Coverlets.—For an upper cover, it is of great importance that its texture should be such as to prevent the wind ever blowing through. If it does so, no thickness is of any avail in keeping out the cold; hence the advantage of skin carosses, buffalo robes, leather sheets, and mackintosh rugs. All cloths lose much of their closeness of texture in a hot, dry climate, the fibres shrink extremely, and the wind blows through the tissue as through net-work. It is in order to make their coverings wind-proof, that shepherd lads on the hills in Scotland, when the nights are cold, dip their plaids in water before sitting or lying down in them. The wet swells up the fibres of the plaid and makes the texture of it perfectly dense and close. It is also of importance that the outer covering should have a certain weight, so as not to be too easily displaced, either by the person fidgeting in his sleep or by the blowing of the wind. In dry weather, there is nothing like a sheepskin caross; but in a rainy country, I should prefer a thick blanket bag, a large spare blanket, and a mackintosh sheet and counterpane. People may object that the bag and mackintosh would be close and stuffy, but be assured that the difficulty when sleeping on mother earth on a bitter night is to keep the fresh

air out, not to let it in; on fine nights I should sleep on the bag and under the spare blanket.

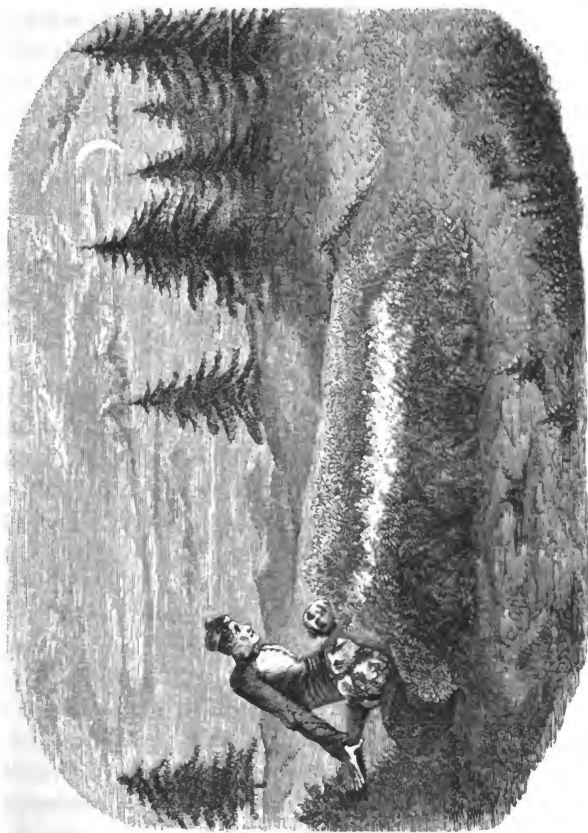
Brown paper is an excellent non-conductor of heat, and English cottagers often inclose sheets of it within their quilted counterpanes.

Sleeping bags.—The peasants in the northern parts of Germany use a strong linen sack, made to draw at one end. This they stuff with straw, hay, dry leaves, &c., and putting their feet into it, pull its mouth up to their armpits. They use them when driving their waggons in winter, and when lodging at wretched roadside inns. (See a Letter in the *Times*, Feb. 12, 1855.) Arctic travellers use coarse drugget bags, covered with brown holland to keep them more wind-tight, and having a long flap at the upper end to fold down over the face.

“I found great comfort in a waterproof bag, into which I could creep in rain when I had no tent, or on which I slept when the weather was fine. A flap at the open end of the bag covered my head in rain, and a trench dug round it placed me on a dry island.” (Sir J. Alexander, MSS.)

§ 3. DIFFERENT WAYS OF BIVOUACKING.—Mr. St. John tells us of an excellent way in which Highland poachers, when in a party, usually pass frosty nights on the moor-side. They cut quantities of heather, and strew part of it as a bed on the ground, then all the party lie down, side by side, excepting one man, whose place among the rest is kept vacant for him. His business is to spread plaids upon them as they lay, and to heap up the rest of the cut heather upon the plaids. This being accomplished, the man wriggles and works himself into the gap that has been left for him in the midst of his comrades.

If a night of unusual cold be expected, the best use to



make of spare wearing-apparel is to put it on over those that are already on the person. With two or three shirts, stockings, and trousers, though severally of thin materials, a man may get through a night of very trying weather.

However wet the weather may be during the day, the tra-

veller should never relax his endeavours to keep a dry and warm change of clothes for his bivouac at night. Hardships in rude weather matter little to a healthy man when he is awake and moving, and while the sun is above the horizon; but let him never forget the deplorable results that may follow a single night's exposure to cold, malaria, and damp. (See p. 31.)

Bivouac and travels in the Arctic regions.—Lieutenant Cresswell, who, having been detached from Captain McClure's ship in 1853, was the first individual who ever accomplished the famous North-West passage, gave the following graphic account of the routine of his journeying, in a speech at Lynn. "You must be aware that in Arctic travelling you must depend entirely upon your own resources. You have not a single thing else to depend on except snow-water; no produce of the country, nor firewood, or coals, or anything of the sort; and whatever you have to take, to sustain you for the journey, you must carry or drag. It is found by experience more easy to drag it on sledges than to carry it. The plan we adopt is this—we have a sledge generally manned by about six or ten men, which we load with provisions, with tents, and all requisites for travelling, simple cooking utensils, spirits of wine for cooking, &c., and start off. The quantity people can generally drag over the ice is 40 days' provisions, that gives about 200 lbs. weight to each. After starting from the ship, and having travelled a certain number of hours—generally 10 or 11—we encamp for the night, or rather for the day, because it is considered better to travel at night and sleep at day, on account of the glare of the sun on the snow. We used to travel journeys of about 10 hours, and then encamp, light our spirits of wine, put our kettle on it to thaw our snow-water, and after we had had our supper—just a piece of

pemmican and a glass of water—we were glad to smoke our pipes and turn into bed. The first thing we did after pitching the tent, was to lay a sort of mackintosh covering over the snow, on this a piece of buffalo robe was stretched. Each man and officer had a blanket sewn up in the form of a bag, and into these we used to jump, much in the same way as you may see a boy do in a sack. We lay down head and feet, the next person to me having his head to my feet, and his feet to my head, so that we lay like herrings in a barrel. After this, we covered ourselves with skins, spreading them over the whole of us, and the closer we got, the better, as there was more warmth. We lay till the morning, and then the process was the same again.”

Mr. Gordon Cumming.—The following extract is from Mr. Gordon Cumming’s book on Africa; it describes the preparations of a practised traveller, for a short excursion from his waggons away into the bush. “I had at length got into the way of making myself tolerably comfortable in the field, and from this date I seldom went in quest of elephants without the following *impedimenta*, *i.e.* a large blanket, which I folded and secured before my saddle as a dragoon does his cloak, and two leather sacks, containing a flannel shirt, warm trousers, and a woollen night-cap, spare ammunition, washing rod, coffee, bread, sugar, pepper and salt, dried meat, a wooden bowl, and a tea-spoon. These sacks were carried on the shoulders of the natives, for which service I remunerated them with beads. They also carried my coffee kettle, two calabashes of water, two American axes, and two sickles, which I used every evening to cut grass for my bed, and likewise for my horses to eat throughout the night; and my after-rider carried extra ammunition and a spare rifle.”

I have been informed of a sportsman in Ceylon, who took

with him into the woods a cot with mosquito curtains as a protection, not only against insects, but against malaria, and had a blanket rolled at his feet. At 3 in the morning, when the chill arose in the woods, he pulled his blanket over him.

To conclude, let the traveller, when out in trying weather, work hard at making his sleeping-place perfectly dry and comfortable; he should not cease until he is convinced that it will withstand the chill of the early morning, when the heat of the last sun is exhausted and that of the new sun has not begun to be felt. It is wretched beyond expression for a man to lie shivering beneath a scanty covering, and to feel the night air become hourly more raw, while the life-blood has less power to withstand it; and to think self-reproachfully how different would have been his situation if he had simply had forethought and energy enough to cut and draw twice the quantity of firewood, and to spend an extra half-hour in labouring to make a snugger berth. The omission once made becomes irreparable, for in the dark and cold of a pitiless night, he lacks stamina to rise and face the weather, and has no means of coping with his difficulties.

Pillows.—A mound of sand or earth scraped together, wears flat down after a few minutes. A bag filled with earth, or it may be grass, keeps its shape. Many people use their saddles as pillows; they roll up the flaps and stirrups, and place the saddle on the ground with a stone underneath, at its hindmost end, to keep it level and steady, and then lay their heads on the seat. I prefer using anything else, as, for instance, the stone without the saddle; but I generally secure some bag or other for the purpose: however, without some sort of pillow, it is difficult to sleep. Air pillows are very convenient.

Mr. Mansfield Parkyns' excellent plan, of sleeping on the side, with the stock of the gun between the head and the arm, and the barrel between the legs, will be again mentioned at length, p. 191.

§ 4. HUTS, TENTS, AND AWNINGS.—*Huts*.—Where there are trees, a bothy may soon be built with a little dexterity. The most complete sort is made by sticking bare sticks, four feet long or more, into the ground, and bending their tops together, lashing them fast with string or strips of bark, and wattling them judiciously here and there. Then, by heaping leaves, and especially broad pieces of bark if you can get them, over all, and banking up the earth on either side pretty high, an excellent kennel is made.

If daubed over with mud, clay, or cattle dung, it becomes more air-proof. To proceed a step further,—as many poles may be planted in the ground as you have employed sticks in making the roof; and then lifting the roof bodily up in the air, it may be lashed on to the top of the poles, each stick to its corresponding pole. This sort of structure is very common among savages.

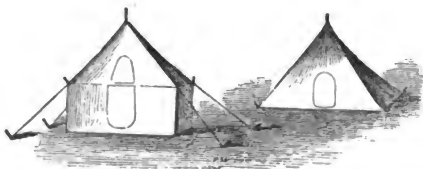
For methods of digging holes in which to plant the tent-poles, see pp. 9, 10.

Tents, although not worth the trouble of pitching on dry nights in a healthy climate, are invaluable protectors against rain, dew, and malaria. To a party encamped for a few days, they are of great use as store-houses for loose luggage, which otherwise becomes scattered about, at the risk of being lost or pilfered. The art of tent-making has greatly advanced since the days of the old-fashioned bell-tent, which is so peculiarly objectionable as to make it a matter of surprise that it was ever invented and used. It is difficult to pitch, requires many tent-pegs, has ropes radiating all round it,

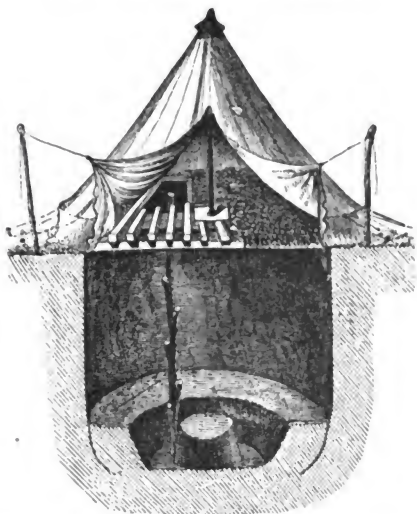
over which men and horses stumble, is incommodious, and ugly.

In choosing a tent, select one in preference that will stand in shape with only four pegs, or with six at the very utmost; it should peg close down to the ground, without the intervention of any ropes; it is of no objection that it should require more than one pole; and as to its weight, it must be borne in mind that the weight of a tent is far greater in actual travel than it is found to be in a maker's dry show-room. All tents should have a strong cover, for pack-ropes are sure to fray whatever they press against, and it is better that the cover should suffer than the tent itself.

A pyramidal tent, one of seven or nine feet in the side, is a very sturdy tent: it will stand any weather, will hold two people and a fair quantity of luggage besides, and weighs from 25 to 40 lbs. By taking an additional joint to the tent-pole, and using tent-ropes (as may also be done with any other kind of tent), it may be raised up, and walls added to it, of bushes, sods of turf, or spare cloths, as in the left-hand figure. But if the



soil be quite dry, it is a snigger plan to dig a hole and lower the ground of the tent, than to raise it upon walls. Some tents attracted much notice at Sebastopol to which underground cellars had been dug, and boarded over, so that the house consisted of two stories. A traveller who had to make a tent for himself would, I think, find a pyramidal one to be



the best for him : but if he had the opportunity of going to a good tent-maker, he would meet with more roomy and convenient ones ; but being at the same time more complex, they require skilled workmanship to cut out and to sew together. I believe Edgington's three-poled tents, of from 13 to 16 feet in the side, to be beyond doubt the best shape that has ever been contrived for a traveller.

Where a tent is pitched for an encampment of some duration, it is well to lay aside the jointed tent-pole, and to cut a stout young tree to replace it ; this will be found far more trustworthy in stormy weather.

If the shape of the tent admits of it, it is better still to do away with the centre pole altogether, and, in place of it, to erect a substantial framework of poles which are to be planted just within the rim of the tent, and to converge to a point, under its peak.

For tents of a smaller size and less pretensions, nothing can be better than one of this shape; the ends are slit down their middles, and are laced or buttoned together, so that by unfasten-



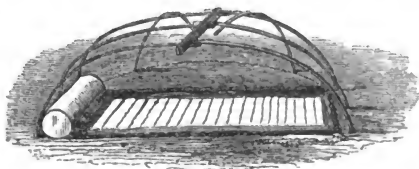
ing these, the tent spreads out to a flat sheet, well adapted for an awning, or else it can be simply unrolled and used with the bedding. It is necessary that a tent should be roomy enough to admit of a man undressing himself, when wet through, without treading upon his bed and drenching it with mud and water; and therefore a tent of the above description is found to be unserviceable if less than about 7 feet long, or ending in a triangle of less than $5\frac{1}{2}$ feet in the side. Peat, the saddler in Bond Street, makes these; they cost 2*l.* 10*s.*, and weigh 9 lbs. when dry.

Guns or faggots of brushwood may be used as makeshifts for their tent-poles.

The *Tente d'Abri* of the French soldier is pitched much like the preceding. Each soldier carries a square of canvas with buttons and button-holes all round it, by which it can be doubly attached to other similar squares of canvas; and thus from several separate pieces one large cloth can be made. The square carried by the French soldier measures 5 ft. $4\frac{1}{2}$ in. in the side, reckoning along the buttons; of these there are nine along each edge, including the corner ones.

Further on, in page 114, the way is shown by which sailors make a tent out of their lug-sail, throwing it over a framework of oars.

A traveller who has only a blanket, a plaid, or broad piece of material of any kind, wherewith he wishes to improvise a tent, should make a framework of long wands, planting their ends in the ground, bending their tops together, and lashing or wattling them securely; over this the blanket is thrown. The gipsies in England use an excellent contrivance to the same effect: they dispense with the trouble of lashing and wattling the ends of the wands, by carrying a light bar of wood, $2\frac{1}{2}$ feet long, bound with string here and there to keep



it from splitting; through this, six holes, each big enough to admit the tip of the little finger, are bored or burnt; they also carry eight hazel rods with them, each 6 feet long, and arrange their framework as in the drawing. It will be observed that the two rods which are planted behind, give additional roominess and stability to the affair. The occupants sleep, as indicated in the sketch, by the rug and pillow, and blankets pinned together with wooden pegs are thrown over the whole.

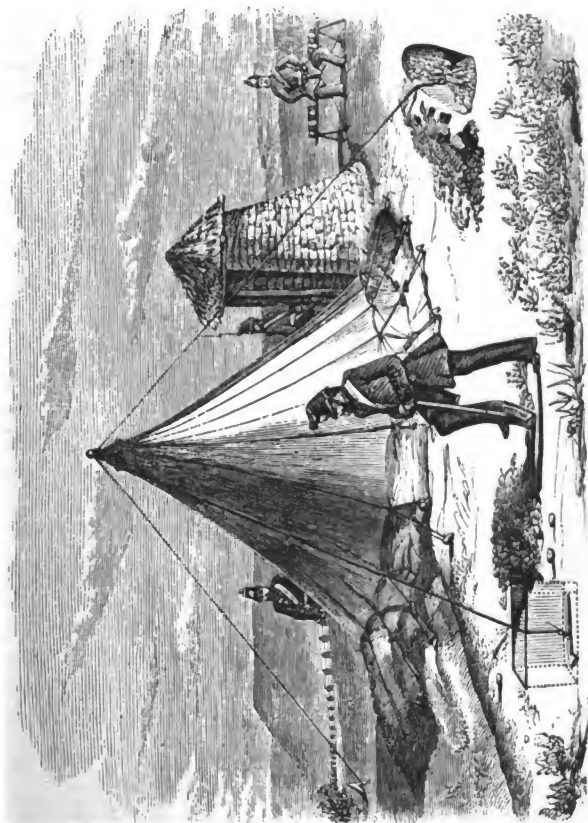
Colonel Frémont, the American traveller, bivouacked as follows:—his “rifles were tied together near the muzzles, the butts resting on the ground, and a knife laid on the rope, to cut away in case of an alarm; over this, which made a kind of frame, was thrown a large indian-rubber cloth, with which he used to cover his packs; this made a tent sufficiently large to receive about half of his bed, and was a place of shelter for his instruments.”

Materials for tents.—Canvas, or, more strictly speaking, Os'naburg, is usually employed, and is, to all intents and purposes, waterproof. Silk, of equal strength with the canvas, is very far lighter; its only fault is its expense. Calico, or cotton canvas, is very generally used for the smaller kind of tents. Leather is warm, but very heavy indeed, and would only be used where canvas could not be met with. Light matting is not to be despised; it is warm and pretty durable, and makes excellent awning, or coverings to a framework. A worn-out tent may be strengthened by sewing bands of canvas, which cross each other, and make a kind of net-work. Old sails are strengthened in this way. The tent-pegs should be of galvanized iron; they are well worth the weight of carriage, for not only do wooden ones often fail on an emergency, but cooks habitually purloin them when firewood is scarce.

Tarpaulings, made in the sailors' way, are much superior to others in softness and durability. As soon as the canvas is sewn together, it is thoroughly wetted with sea-water; and while still wet, is done over on one side with tar and grease boiled together—about two parts tar and one of grease. Being hung up till dry, it is turned, and the other side, being a second time well wetted, is at once painted over with the tar and grease just as the first side had been before. The sailors say that "the tar dries in as the water dries out."

Pitching a tent is quite an art,—so as to let in or exclude the air, to take advantage of sun and shade, &c. &c. There is a great deal of character shown in an encampment: every available cloth or sheet may be pressed into service, to make awnings and screens, as we see among the gipsies. Before a stormy night, dig a ditch as deep as you can, round the outside of the tent, to turn aside the water, and to drain the

ground on which it stands—even a furrow scratched with a tent-peg is better than nothing at all. Fasten guy-ropes to the spike of the tent-pole, and be careful that the tent is not too much on the strain, else the further shrinking of the



materials, under the influence of the rain, will certainly tear up the pegs.

The ground is often such that the tent-pegs will not "hold;" if it be sandy, scrape the surface sand away before driving them in, and put a flat stone under the foot of the pole as a step for it to rest on, or it will work a deep hole, and, sinking down, will leave the tent slack and unsteady. If the sand is very deep, it is an excellent plan to bury sticks or bushes, two or three feet deep, and to tie the tent corners to the middle of them, instead of to pegs. Bags of sand, or of shingle, may also be buried.

Bushing a tent means the burying of bushes in the soil so far as to leave only their cut ends above the ground to which a corresponding number of the ropes of the tent are tied. Heavy saddle-bags are often of use to fasten the tent to, and in rocky ground heavy piles of stones may be made to answer the same purpose.

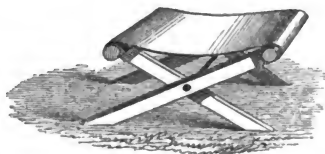
Natives are apt to creep up, and, putting their hands under the tent, to steal things: a hedge of bushes is some protection against them.

A tent should never be pitched in a slovenly way; it is so far more roomy, secure, and pretty, when tightly stretched out, that no pains should be spared in drilling the men to do it well. I like to use a piece of string, marked with knots, by which I can measure the exact places in which the tent-pegs should be struck; the eye is a very deceitful guide in estimating squareness. It is wonderful how men will bungle over a tent when they are not properly drilled to pitch it. (*See p. 244.*)

§ 5. TENT FURNITURE.—A portable bedstead, with musquito curtains, is a very great luxury, raising the sleeper above the damp soil, and the attacks of most creatures that creep on it; in tours where a few luxuries can be carried, it is a very

proper article of baggage. Hammocks and cots have but few advocates, as it is rare to find places adapted for swinging them; they are quite out of place in a small tent.

Chairs and tables.—It is advisable to take very *low* strong and *roomy* camp-stools, with tables to correspond in height,

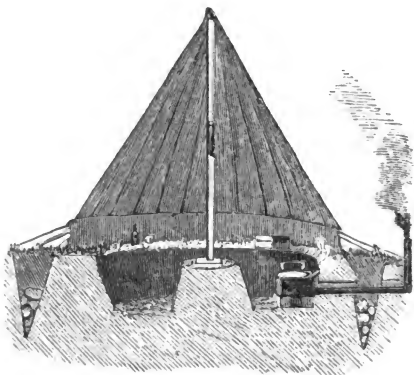


as a chamber is much less choked up when the seats are low, or when people sit, as in the East, on the ground. The seats should not be more than 1 foot high, though as wide and deep as an ordinary footstool. Habit very soon reconciles travellers to this; but without a seat at all, a man can never write, draw, nor calculate as well as if he has one. A good stool is of this sort, with a full-sized leather or canvas seat, or one made of strips of dressed hide. The table should be a couple of boards, not less than 2 feet long, by 9 inches broad, hinged lengthwise together, and resting on a stand, on the same principle as the above chair. It would be well to have it made of common mahogany, for deal warps and cracks excessively. There is no difficulty in carrying furniture like the above on a pack-horse.

For want of a chair, it is very convenient to dig a hole or a trench in the ground, and to sit on one side of it, with the feet resting on its bottom; the opposite side of the trench serves as a table.

To tie clothes, or anything, up to a smooth tent pole, see *Clovehitch*, p. 134.

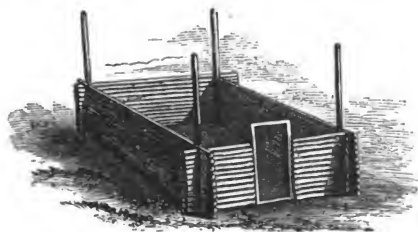
The accompanying sketch shows a tent pitched for a lengthened habitation. It has a deep drain, a seat and table dug out, and a fire-place.



Losing things. — Small things are constantly mislaid and trampled in the sand: to search for them, the ground should be disturbed as little as possible—it is a usual plan to score its surface in parallel lines with a thin wand. It would be well worth while to make and use a small light rake for this purpose.

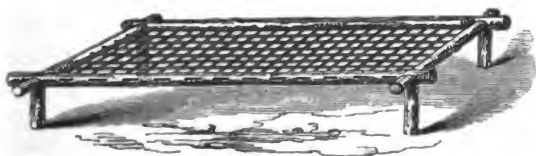
§ 6. RUDE HOUSES.—In making a *depôt*, it is usual to build a house; often the men have to pass weeks in inactivity, and they may as well spend them in making their quarters comfortable, as in idleness. Whatever huts the natives live in are sure, if made with extra care, to be sufficient for travellers. Cow-dung and ashes make a hard, dry, and clean floor; ox-blood and fine clay, kneaded together, is excellent: both

these compositions are used in all hot, dry countries. In building log-huts, four poles are driven in the ground to correspond to the four corners ; against these logs are piled,



one above another, as in the drawing ; they are so deeply notched where they cross one another, that each two adjacent sides are firmly dovetailed together. When the walls are entirely completed, the door and windows are chopped out. It of course requires a great many trees to make a log-hut ; for supposing the walls to be 8 feet high, and the trees to average 8 inches in diameter, it would require 12 trees to build up one side, or 48 to make all four walls.

Fix hooked sticks, and cow or goat horns, round the walls, as pegs to hang things on ; and if you want a luxurious bed, make a cartel, which is on the principle of a tennis player's racket,



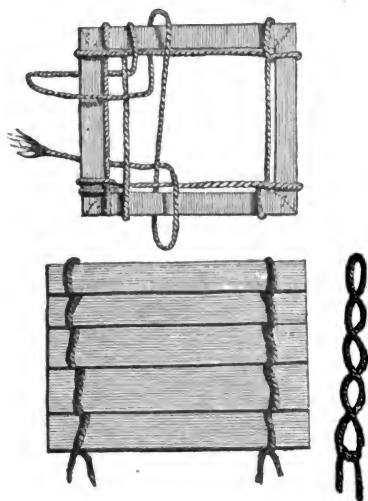
being a framework of wood, with strips of raw hide lashed across it from end to end and from side to side. If you collect

bed feathers, recollect that if cleanly plucked they require no dressing of any kind, save drying and beating. Concrete for floors is made of 80 parts large pebbles, 40 river sand, 10 lime: lime is made by burning limestone, chalk, shells, or coral, in a simple furnace, and whitewash is lime and water. Bark makes a good roof. The substitutes for glass are, waxed or oiled paper or cloth, bladder, fish membranes, talc, and horn (*which see*). Glass cannot be cut with any certainty without a diamond, but it may be shaped and reduced to any size by gradually chipping, or rather biting, away at its edges with a key, if the slit between its wards be just large enough to admit the pane of glass easily. A musquito curtain may be taken and suspended over the bed, or place where you sit. It is very pleasant, in hot, musquito-plagued countries, to take the glass sash entirely out of the window frame, and replace it with one of gauze. Broad network, if of fluffy thread, keeps wasps out. The darker a house is kept, the less willing are flies, &c., to flock in. If sheep and other cattle be hurdled in near the house, the nuisance of flies becomes almost intolerable.

Straw or reed walls are made of bundles of reeds, nipped between pairs of poles; they can be made moveable, so as to suit the wind, shade, and aspect; their edges should be neatly trimmed; even gates can be made on this principle.

To plait mats.—Damp the straw and beat it with a wooden mallet, as by doing so it will work more easily. Mats can be made by plaiting breadths and sewing the breadths side by side; or, by taking a wisp and working it in the way in which straw beehives are made; or twisting it in and out, round a frame, as shown in the picture: this is the way of making rush-bottomed chairs. Strips of bark may be wove, long reeds may be threaded and even stitched together, and the lower figures of the sketch show a wonderfully simple way of

attaching together wisps of straw, rods, laths, reeds, planks, poles, or anything of the kind, into a secure and flexible mat; the sails used in the far East are made in this way, and the moveable decks are made of bamboos joined together with a similar but rather more complicated stitch.



Soldiers might be trained to a great deal of hutting practice, in a very inexpensive way, if they were drilled at putting together huts whose roofs and walls were made of planks lashed together by this simple stitch, and whose supports were short scaffolding poles planted in deep holes dug, as explained (p. 9), without spades or anything but the hand and a small stick. The poles, planks, and cords might be used over and over again for an indefinite time. Further, bedsteads could be made in a similar way by short cross planks lashed

together, and resting on a framework of horizontal poles, lashed to uprights planted in the ground. The soldier's bedding would not be injured by being used on these bedsteads, in the way it would be if laid on the bare ground. Many kinds of designs and experiments in hutting could be practised without expense in this simple way.

CLOTHES, ETC.

§ 1. Articles of Dress.

§ 2. Personal Cleanliness.

§ 3. Knapsacks, Knives.

§ 4. Dry Clothes.

§ 1. ARTICLES OF DRESS.—The importance of flannel next the skin can hardly be overrated; it is now a matter of statistics, for during the progress of expeditions, notes have been made of the number and names of those in them who had provided themselves with flannel, and of those who had not. The list of sick and dead always included names from the latter list in a very great proportion. Next in excellence to flannel comes cotton; according to the common voice of all who know the tropics, linen is very improper, for when the wearer is wet with rain or perspiration, it strikes cold upon the skin; coarse calico shirts, for fine, hot, dry weather, and flannel for damp, windy, or cold, are, I should suggest, the proper dress.

A poncho is very useful, for it is a sheet as well as a cloak, being simply a blanket with a slit in the middle to admit the wearer's head. A sheet of strong calico, saturated with oil, makes a waterproof poncho. Cloth is made partly waterproof by rubbing soap-suds into it (on the wrong side), and working them well in; and when dry, doing the same with a solution of alum; the soap is by this means decomposed, and the oily part of it distributed among the fibres of the cloth.

Coat, waistcoat, and trousers.—A tweed shooting costume is, taking it all in all, the best, but it should be of thick, not thin.

material, for all except damp and tropical countries. If you are likely to have much riding, take extra leather or moleskin trousers, or tweed covered down the inside of the legs with leather, such as cavalry soldiers generally wear. Leather is better than moleskin against thorns, but worse against wet—it will far outlast moleskin. There should be no hem to the bottom of the legs of trousers, as the wet is materially retained by one. Waistcoats are generally laid aside unused. A leather coat is good in cases where leather trousers are advisable. A blouse, cut short so as to clear the saddle, is neat, cool, and easy, as a riding or walking costume. A thick dressing-gown is of very great comfort; persons who travel, even with the smallest quantity of luggage, would do well to take one. It is a relief to put it on in the evening, and is a warm extra dress for sleeping in;—whether in hot or in cold weather, it is eminently useful, comforting, and durable. The same may be said of slippers.

Socks.—The hotter you expect the ground to be on which you have to walk, the thicker should your socks be. Have plenty of woollen socks.

Braces.—Do not despise them, nor omit to take two pairs.

Shoes.—Nothing is equal to European shoes; if they wear out, and none of the party are successful in making others from dressed hide, recollect sandals. If travelling in a hot, dry country, grease plentifully both your shoes and all other leather.

There are such varieties in dress, that it would be endless to prolong these remarks; I therefore continue the subject with a list of clothes, suggested by an eminent Australian traveller for the equipment of a party who might travel there. To which I would suggest, in addition, one pair warm mittens; one pair slippers; one short blouse, blue or grey; one mackin-

tosh sheet. It must be recollected that the climate of Australia oscillates between the widest extremes of heat and cold, dry and wet.

Outfit.

2 woollen under shirts.	1 wide-awake felt hat, with glazed cover.
2 blue over „	2 pairs warm gloves.
1 red „ shirt.	3 pairs strong ankle-boots, well nailed.
2 pairs tweed trousers.	1 long pea-jacket of thick cloth.
1 pair moleskin „	1 very light waterproof coat.
1 pair duck „	1 broad, polished leather belt.
2 pairs braces.	2 towels.
1 Scotch cap, for sleeping.	1 clasp-knife, with hole through haft to tie on to waistband.
2 black neck-ties.	1 comb.
6 pairs woollen socks.	3 small, but good, blankets.
6 „ cotton „	
6 large cotton handkerchiefs.	
1 cabbage-tree hat.	

Mr. Gordon Cumming describes his bush costume as follows : —“ My own personal appointments consisted of a wide-awake hat, secured under my chin by ‘rheimpys’ or strips of dressed skin, a coarse linen shirt, sometimes a kilt, and sometimes a pair of buckskin knee-breeches, and a pair of ‘veldtschoens,’ or home-made shoes. I entirely discarded coat, waistcoat, and neckcloth; and I always hunted with my arms bare; my heels were armed with a pair of powerful persuaders, and from my left wrist depended, by a double rheimpy, an equally persuasive sea-cow jambok. Around my waist I wore two leathern belts or girdles. The smaller did the duty of suspender, and from it on my left side depended a plaited rheimpy, eight inches in length, forming a loop, in which dangled my powerful loading-rod, formed of a solid piece of horn of the rhinoceros. The larger girdle was my shooting belt; this was a broad leather belt, on which were fastened four separate compart-

ments, made of otter skin, with flaps to button over, of the same material. The first of these held my percussion-caps, the second a large powder-flask, the third and fourth, which had divisions in them, contained balls and patches, two sharp clasp-knives, a compass, flint and steel. In this belt I also carried a loading-mallet, formed from the horn of the rhinoceros; this and the powder-flask were each secured to the belt by long rheimpys, to prevent my losing them. Last, but not least, in my right hand I usually carried my double-barrelled two-grooved rifle, which was my favourite weapon. This, however, I subsequently made up my mind was not the tool for a mounted man, especially when quick loading is necessary."

Sir James Alexander, in the hot and damp forests of America, used the following wardrobe:—Red-flannel shirt, moleskin trousers, brown leather boots, and a soft grey hat. A loose jacket and dry worsted socks and moccassins formed a safe change for the night.

Substitute for Socks.—For want of socks, pieces of linen may be used, and when these are properly put on they are said to be even better than socks. They should be a foot square, be made of soft worn linen, be washed once a-day, and be smeared with tallow. They can be put on so dexterously as to stand several hours' marching without making a single wrinkle. To put them on, the naked foot is placed on one of the diagonals; the triangles on the right and on the left are then folded over, then the triangle which lies in front of the toes. Now the art consists in so drawing up these ends, that the foot can be placed in the shoe or boot without any wrinkles appearing in the bandage. One wrinkle is sure to make a blister, and therefore persons who have to use them, should practise frequently how to put them on. Socks similar to these, but

made of thick blanket, and called "Blanket Wrappers," are in use at Hudson's Bay instead of shoes.

Shirt sleeves.—When you have occasion to tuck up your shirt sleeves, recollect that the way of doing so is not to begin by turning the cuffs inside out, but outside in—the sleeves must be rolled up inwards, towards the arm, and not the reverse way. In the one case, the sleeves will remain tucked up for hours without being touched; in the other, they become loose every five minutes.

§ 2. PERSONAL CLEANLINESS.—There is no denying the fact, though it be not agreeable to confess it, that dirt and grease are great protectors of the skin against inclement weather, and that therefore the leader of a party should not be too exacting about the appearance of his less-warmly clad followers. Daily washing, if not followed by oiling, must be compensated for by wearing clothes. Take the instance of a dog. He will sleep out under any bush, and thrive there, so long as he is not washed, groomed, and kept clean; but if he be, he must have a kennel to lie in. A savage will never wash unless he can grease himself afterwards,—grease takes the place of clothing to him. I mentioned previously a Swedish proverb; it would be very true if varied thus, "Grease and dirt are the savage's wearing apparel!" There must be a balance between the activity of the skin and the calls upon it, and where the exposure is greater, there must the pores be more defended. This is a strangely artificial state that we live in, in Europe, where our whole body is swathed up in many folds of dress, excepting the hands and face, the first of which are frequently gloved. We can afford to wash, but naked men cannot.

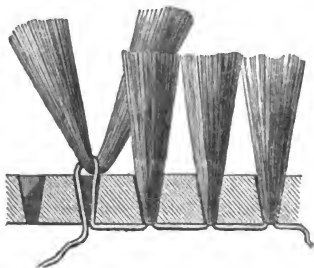
Toilet in travel.—The most convenient time for a traveller to make his own toilet, in rough travel, is after the early

morning's ride, a bath being now and then taken in the afternoon. It is trying work to wash in ice-cold water, in the dark, early, and blowing morning, besides which, when the sun rises up, its scorching heat tells severely on a washed face. Where water has to be economised, the best way of making a little go very far is the Mahomedan fashion, in which an attendant pours a slender stream from a jug, which the washer receives in his hands and distributes over his person. (*See Soap and its substitutes.*)

Bath glove.—Fold a piece of very coarse towel in two parts; lay your hand upon it, and mark its outline rudely; then, guided by the outline, cut out the two pieces below; sew these together along their edges, and the glove is made.

This is an admirable invention for travellers; it was brought to my notice by Sir James Alexander, and, since first hearing of it, I have regularly used it. It is most easily made, inexpensive, and portable, and is as good a detergent as horse-hair gloves or flesh brushes.

Brushes.—It is well to know how to make a brush, whether for clothes, boots, or hair, and the accompanying section of one will explain itself.



§ 3. KNAPSACKS, KNIVES.—It is recommended that knapsacks,

if not exceeding 6 pounds in weight, should be attached to a belt, and made to lie against the small of the back. When the bearer sits down to rest himself, the weight of his burden is at once relieved, and it is much speedier work to unbuckle the belt than to struggle out from the thongs of a knapsack. In hot countries, the confinement from these straps is unbearable. A fishing basket replaces a knapsack excellently, it is perhaps the better of the two. Sixteen or twenty pounds' weight, at the outside, is as much as a man not trained to the business should carry. English knapsacks have a bad reputation; they are said to be neither light nor waterproof.

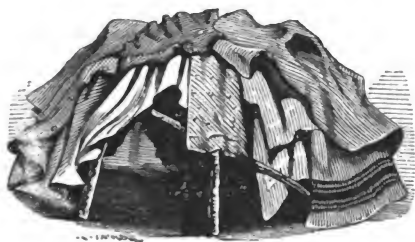
Knives.—A great hunting knife is a useless incumbrance; no old sportsman and traveller cares to encumber himself with one; but a butcher's knife, in a sheath, is an excellent thing, both from its efficient shape, the soft quality of the steel, its lightness, and the strong way in which the blade is set in the haft. If a traveller wants a pocket knife full of all kinds of tools, he had better order a very light one of $2\frac{3}{4}$ inches long, in a tortoiseshell handle. It should have a turnscrew at one end and a light "picker" to shut over its back. This will act as a strike-light, and as a file also, if its under surface be properly roughened. Underneath the picker, a small triangular thing to bore holes in leather; and a gimlet. In front of the knife a long narrow pen-blade of *soft* steel; a cobbler's awl, slightly bent; and a packing-needle with a large eye, to push thongs and twine through holes in leather.—It may be thought advisable to increase the size of the knife and to add a button-hook, a corkscrew, and a large blade; but a light knife is a constant companion, while a heavy one is laid by, and never at hand when wanted.

§ 4. DRY CLOTHES.—“I may as well tell, also, how we managed to keep our clothes dry when travelling in the rain: this

was rather an important consideration, seeing that each man's wardrobe consisted of what he carried on his back. Our method was at once effective and simple; if halting, we took off our clothes and sat on them; if riding, they were placed under the leathern shabraque of the mule's saddle, or under any article of similar material, bed or bag, that lay on the camel's pack. A good shower-bath did none of us any harm, and as soon as the rain was over, and the moisture on our skins had evaporated, we had our garments as warm, dry, and comfortable, as if they had been before a fire. In populous districts, we kept on our drawers, or supplied their place with a piece of rag, or a skin, and then, when the rain was over, we wrapped ourselves up in our 'quarry,' and taking off the wetted articles, hung them over the animals' cruppers to dry." (Mr. Parkyns.) And again, in another author, "The only means we had of preserving our sole suit of clothes dry from the drenching showers of rain, was by taking them off and stuffing them into the hollow of a tree, which, in the darkness of the night, we could do with propriety."

Captain Bligh, who was turned adrift in an open boat after the Mutiny of the *Bounty*, writes thus about his experience:—"With respect to the preservation of our health, during a course of 16 days of heavy and almost continual rain, I would recommend to every one in a similar situation the method we practised, which is to dip their clothes in the salt water and wring them out as often as they become filled with rain: it was the only resource we had, and I believe was of the greatest service to us, for it felt more like a change of dry clothes than could well be imagined. We had occasion to do this so often, that at length our clothes were wrung to pieces; for except the few days we passed on the coast of New Holland, we were continually wet, either with rain or sea."

To dry clothes at a smouldering fire, it is very convenient to make a dome-shaped framework of twigs, by bending each twig or wand into a half circle, and planting both ends of it



in the ground, one on each side of the fire. Then laying the wet clothes on this framework, they receive the full benefit of the heat, and the steam passes readily upward.

FOOD AND COOKING.

§ 1. Bad and poisonous Diet.

§ 2. Food from various sources.

§ 3. Preserving Meat, Fish, Butter, Milk, &c.

§ 4. Bush cookery.

§ 5. Plates and Cooking Utensils.

§ 6. Rations.

§ 1. BAD AND POISONOUS DIET.—In reading the accounts of travellers who have suffered severely for want of food, a striking fact is common to all, *i. e.* that carrion and garbage of every kind can be eaten, under those circumstances, without the stomach rejecting it. And life can certainly be supported on a diet which would give severe illness to a man not driven to it by the pangs of hunger. There is, however, a great difference in the power that different people have of eating rank food without being made ill by it. It appears that no flesh, excepting that of some fish, is poisonous to man; but with vegetables it is very different. No certain rule can be given to distinguish wholesome plants from poisonous ones, but it has been observed that much the same things suit the digestion of a bird that suit those of a man, and therefore that a traveller, who otherwise would make trials at hap-hazard, ought to examine the contents of those birds' crops that he may catch or shoot, to give a clue to his experiments. The rule has notable exceptions, but in the absence of any other guide, it is a very useful one.

The only general rules that botany can give are still less to be depended on; they are that a great many wholesome

plants are found among the *Cruciferae*, or those whose petals are arranged like a Maltese cross, and that many poisonous ones are found amongst the *Umbelliferae*.

When rank birds are shot, they should be skinned, not plucked, for much of the rankness lies in their skin. The breast and wings are the least objectionable parts in them, and if there be abundance of food, these should alone be cooked.

The converging flight of crows, and gorged vultures sitting on trees, show where dead game is lying; but it is often very difficult to find the carcase, for animals usually crawl under some bush, or other hiding-place, to die. Jackal tracks, &c., are often the only guide. It may be advisable, after an unsuccessful search, to remove to some distance off, and watch patiently through the day until the birds return to their food, and mark them down.

In hiding game from birds of prey, bush it over, and they will seldom find it out; birds cannot smell well, but they have keen eyes. The meat should be hung from an overhanging bough, then if the birds find it out, there will be no place for them to stand on and tear it.

If any meat that you may get, or if the water of any pool at which you encamp, is under suspicion of being poisoned, let one of your dogs eat or drink before you do, and wait an hour to watch the effects of it upon him.

One man in every party should have learnt from a professed butcher how to cut up a carcase to the best advantage.

§ 2. FOOD FROM VARIOUS SOURCES.—There are two nutritious plants, nettle and fern, that are found wild in very many countries; and therefore the following extract from Messrs. Huc and Gabet's travels in Thibet may be of service:—"When the young stems of ferns are gathered, quite tender,

before they are covered with down, and while the first leaves are bent and rolled up in themselves, you have only to boil them in pure water to realise a dish of delicious asparagus. We would also recommend the nettle, which, in our opinion, might be made an advantageous substitute for spinach; indeed, more than once we proved this by our own experience. The nettle should be gathered quite young, when the leaves are perfectly tender. The plant should be pulled up whole, with a portion of the root. In order to preserve your hands from the sharp biting liquid which issues from the points, you should wrap them in linen of close texture. When once the nettle is boiled, it is perfectly innocuous, and this vegetable, so rough in its exterior, becomes a very delicate dish. We were able to enjoy this delightful variety of esculents for more than a month. Then the little tubercles of the fern became hollow and horny, and the stems themselves grew as hard as wood, while the nettle, armed with a long white beard, presented only a menacing and awful aspect." The roots of many kinds of ferns, perhaps of all of them, are edible.

Bones contain a great deal of nourishment, which is got at by boiling them, pounding their ends between two stones, and sucking them. There is a revolting account in French history, of a besieged garrison of Sancerre, in the time of Charles IX., and again subsequently at Paris, and it may be elsewhere, digging up the graveyards for bones as sustenance.

Honey, to find, when there are bees about.—Catch a bee, tie a feather or a straw to his leg, which can easily be done (natives thrust it up into his body), throw him into the air, and follow him as he flies slowly to his hive; or catch two bees, and turning them loose at places some distance apart, search where their flights converge to. But if bees are very scarce, choose an

open place, and lay a plate of syrup to bait for the bees, and watch for them; after one has fed and flown away again, remove the plate 200 yards in the direction he flew to, and proceed in the same sort of way until the nest is found. The instinct of the honey-bird is well known, which induces him to lead men to hives that he may share in the plunder. The stories that are told of the malice of the bird, in sometimes tricking a man and leading him to sleeping wild animals instead of the bee's nest, are well authenticated.

All old hides or skins of any kind, that are not tanned, are fit and good for food; they improve all soup, by being mixed with it, or they may be toasted and hammered. Long boiling would make jelly of them. Many a hungry person has cooked and eaten his sandals or skin clothing.

Most kinds of creeping things are eatable, and used by the Chinese. Locusts and grasshoppers are not at all bad. To prepare them, pull off the legs and wings, and roast them with a little grease in an iron dish, like coffee. Rank sea-birds, if caught, put in a coop, and fed with corn, were found by Captain Bligh to become fat and well-tasted.

§ 3. PRESERVING MEAT, FISH, BUTTER, MILK, ETC.—When meat has to be carried in store, or left *en cache*, it should be made into pemmican—that is to say, into dried and pounded meat, which is better than that which is jerked, or simply dried. Mr. Ballantyne, who was in the service of the Hudson Bay Company, gives the following account of the preparation of both of these. “Having shot a buffalo, the hunters cut lumps of his flesh, and slitting it up into flakes or layers, hang it up in the sun, or before a slow fire, to dry: *and the fat can be dried as well as the lean*. In this state, it is often made into packs, and sent about the country, to be consumed as dried meat; but when pemmican is wanted, it has to go

through another process. When dry, the meat is pounded between two stones till it is broken into small pieces; these are put into a bag made of the animal's hide, with the hair on the outside, and well mixed with melted grease; the top of the bag is then sewn up, and the pemmican allowed to cool. In this state it may be eaten uncooked; but the men who subsist on it when travelling, mix it with a little flour and water, and then boil it, in which state it is known throughout the country by the elegant name of *robbiboo*. Pemmican is good wholesome food, will keep fresh for a great length of time, and were it not for its unprepossessing appearance, and a good many buffalo hairs mixed with it, through the carelessness of the hunters, would be very palatable. After a time, however, one becomes accustomed to these little peculiarities." The best pemmican is a mixture of about $\frac{4}{5}$ ths of pounded dry meat to $\frac{1}{5}$ ths of melted or boiled grease, and put into a skin bag or tin can whilst warm and soft. The grease ought not to be very warm when poured on the dry meat. "Four expert men slice up a full-grown buffalo in four hours and a half." (Leichardt.) The American buccaneers acquired their name from *boucan*, which means jerked meat, in an Indian dialect; for they dried the flesh of the wild cattle that they hunted down and killed, to provision their ships. (*See* p. 77.)

Caviare is another kind of portable food. It is made out of fish roe, but the *recherché* sort only from that of the sturgeon. Long narrow bags of strong linen, and a strong brine, are prepared. The bags are half filled with the roe, and then quite filled with the brine, which is allowed to ooze through slowly. This being done, the men wring the bags strongly with their hands, and the roe is allowed to dry. Roe broth is a good dish. Fish may be pounded entire, just as they come

from the river, dried in the sun in large lumps, and kept. The negroes about the Niger do this. Eggs, also, may be dried at a gentle heat, pounded and preserved. This is a convenient plan of making a store out of sea-birds' eggs, or even of those of ostriches.

Salting animals.—It is well to recollect that for want of a salting tub, animals can be salted in their own hide. A hollow is scraped in the ground, the hide laid over it and pegged down, and the meat, salt, and water put into it. I know of an instance where this was done on a very large scale.

"Butter is preserved by boiling it in a large vessel till the scum rises. A person stands watching, to skim this off as fast as it appears on the surface, until the butter remains quite clear like oil, when it is cooled and left for use. It always retains its liquid state. This mode of clarifying butter is adopted throughout Sennaar, Kordofan, &c., and even in Egypt, and is very useful, as the butter thus preserved may be kept for any length of time, and its flavour is but slightly inferior to fresh butter." (Parkyns' "Abyssinia.") It is churned, in many countries, by twirling a forked stick, held between the two hands, in a vessel full of cream.

To keep milk, bottle it, cork it very tight, and put it in a pot of water, over a slow fire, till the water boils. Milk with one's tea is a great luxury, and worth taking some pains about. A traveller is generally glutted with milk when near native encampments, and at other times has none at all.

Dried bread crumb, mixed with fresh cream, is said to make a cake that will keep for some days.

§ 4. BUSH COOKERY.—The most portable and useful condiments for a traveller to take with him are, salt, red pepper, Harvey sauce, lime-juice, dried onions, and curry powder. They should be bought at a first-rate shop, for red pepper,

curry powder, &c., are often atrociously adulterated. The craving felt for salt is somewhat satisfied by saltpetre and other mineral salts; thus we often hear of people reduced to the mixing of gunpowder with their food. In those countries where salt is never used, as I myself have witnessed in South Africa, and among the Mandan North-American Indian tribes (Catlin, vol. i. p. 124), the soil and springs are "brack." Four Russian sailors who were wrecked on Spitzbergen, and whose well-known adventures are to be found in Pinkerton's "Voyages and Travels," had nothing whatever for six years to subsist on save only the animals they killed, a little moss, and melted snow-water. One of them died, the others enjoyed robust health.

Bacon must be carried, in hot climates, in bran, and be uncooked, or the fat will melt away. Meat biscuit, which is used in American ships, is stated to be a thick soup, evaporated down to a syrup, kneaded with flour, and made into biscuits: these are pricked with holes, dried and baked. They can be eaten just as they are, or made into a porridge, with from 20 to 30 times their weight of water. (*See* p. 76.)

Cooking fires.—In cooking for a large party with a small supply of fuel, either dig a narrow trench above which all the pots and kettles may stand in a row, and in which the fire is made,—the mouth being open to the wind, and a small chimney built at the other end,—or else dig a round hole, one foot deep, in the ground, and place the pots in a ring on its edge, half resting on the earth and half overlapping the hole. A space will remain in the middle of them, and through this the fire must be fed.

A few bush dishes should be mentioned :—

Baking meat.—For doing two or three slices, lay one large flat stone upon another, and put a few pebbles between them,

so as to keep them two or three inches apart; then make a fire about them, and when they are thoroughly heated sweep away, and put the slices between them to fry; but where game has to be cooked for a large party, and there are not vessels sufficient to boil it in, it is convenient to sew up as much of the animal as is wanted in its own skin, and to bake it. An entire sheep can be baked. The way is to dig a hole in the ground, wall it with stones, and make a stone roof to it, all excepting one or two apertures. Then having made a roaring fire in and around the oven, till the stones are quite hot, sweep out the ashes, strew with grass, leaves, or bark of any kind that is not bitter, and put the meat in, and over it more grass, &c.; now shut up the aperture, and continue the fire above the oven for some hours. For steaming vegetables, the same process is used, except that boiling water is from time to time poured, through holes on the roof, down on the vegetables. A small piece of meat, enough for four or five people, can be baked with much less preparation, simply by scraping a hole pretty deep under the bivouac fire, putting the meat in, rolled up in the piece of skin to which it remains attached, and covering it with earth and fire. In all cases it is a slow process, requiring many hours, but the meal when done is very soft and juicy, and the skin gelatinous and excellent. Where old white-ant hills are met with, the natives commonly dig holes in their sides, and use them as ovens.

“Meat, previously wrapped up in paper or cloth, may be baked in a clay case, in any sort of pit or oven, well covered over, and with good economy.” (Handbook of Field Service.)

Kabobs, &c.—For a hurried dinner, broil the rib-bones, or skewer your iron ramrod through a dozen small lumps of meat, and roast them. In all cases, if your meat is of a

tough sort, hammer it from time to time, when half done, to break up its fibre, and then continue the cooking.

Salt meat, to prepare hurriedly.—Warm it slightly on both sides—this makes the salt draw to the outside—then rinse it well in a pannikin of water. This process is found to extract a great deal of salt, and to leave the meat in a fit state for cooking.

Soup.—In order to make soup, if you have no vessel that will stand the fire, you must heat stones and drop them into the water; but sandstones, especially, are apt to shiver and make grit. The Dakota Indians, and very probably other tribes also, used to boil animals in their own hide. The description runs thus: "They stuck four stakes in the ground, and tied the four corners of the hide up to them, leaving a hollow in the middle; three or four gallons of water, and the meat cut up very fine, were then put in; three or four (?) hot stones, each the size of a 6lb. cannon-shot, cooked the whole into a good soup." To a fastidious palate, the soot, dirt, and ashes that are usually mixed up with it are objectionable; but these may be avoided by a careful cook, who dusts and wipes the stones before dropping them in. The specific heat of stone is much less than that of water, so that the heating power of a measure of stone is only about one-half of that of an equal measure of equally hot water.

Haggis.—The dish called *beatee* is handy to make. "It is a kind of haggis made with blood, a good quantity of fat shred small, some of the tenderest of the flesh, together with the heart and lungs, cut or torn into small shivers, all of which is put into the stomach and roasted by being suspended before the fire with a string. Care must be taken that it does not get too much heat at first, or it will burst. It is a most delicious morsel, even without pepper, salt, or any seasoning." (Hearne.)

Lunch.—When travelling in the morning and afternoon, tea makes an excellent mid-day meal, with enough bread, or whatever you have, to stay the appetite till the evening supper; it dispels fatigue better than anything else, and it is less heating than coffee. A wooden bowl is the best thing to drink it out of, if you have means of frequently washing it; tin mugs burn the lips too much. A large wooden horn, or bone spoon, is also very convenient.

Tea.—Where there are no cups nor teapot, put the leaves in the pot or kettle, and drink through a reed with a wisp of grass in it, as they do in Paraguay; if there are cups and no teapot, the leaves may be put into the pot, previously inclosed in a loose gauze or muslin bag to prevent their floating about. A contrivance made of metal gauze, and shaped like an egg, is sold in the shops for this purpose. This plan, which is commonly used in England for making tea on a large scale, is well worth being borne in mind by a traveller in civilised countries, who carries an Etna with him.

§ 5. PLATES AND COOKING UTENSILS.—I have travelled much, with plates, knives, forks, &c., for three persons, carried in a sabretasch which hung from the cook's saddle, and I found it very convenient. It was simply a square piece of leather, with a large pocket for the plates, and other smaller ones for the rest of the things; it had a flap to tie over it, which was kept down with a button. Each of the men on a riding expedition should carry his own tin mug, either tied to his waist or to his saddle.

Butcher's knives.—Take plenty of them, and a steel and whetstone.

Cooking apparatus, of any degree of complexity, and of very portable shapes, can be bought at all military outfitters; but for the bush, and travelling roughly, nothing is better than a light

roomy iron pot and a large strong tin kettle. It is very disagreeable to make tea in the same pot that meat is boiled in; besides, if you have only one vessel, it takes a longer time to prepare meals. If possible, take a second small tin kettle, both as a reserve against accidents and for the convenience of the thing. An iron pot, whose lid is the size of the crown of a hat, cooks amply enough for three persons at a time, and can, without much inconvenience, be made to do double duty, and therefore the above articles would do for six men. An iron pot should have very short legs, or some blow will break one of them off and leave a hole. (A hole in the side of a pot can be so botched up as not to leave it altogether useless.) Iron kettles far outwear tin ones, but the comparative difficulty of making them boil, and their great weight, are very objectionable. A good tin kettle, carefully cherished (and it is the interest of the whole party to watch over its safety), lasts many months in the bush. Copper is dangerous; but the receipt is given further on for tinning copper vessels when they require it. Have the handle of the kettle notched or bored, so as to give a holding by which the lid may be tied close down; then if you stuff a wisp of grass into the spout, the kettle will carry water for a journey.

Graters are wanted to grate jerked meat. A piece of tin, punched through with holes, then bent a little, and so nailed on to a piece of wood, makes a good one.

Sieves.—Stretch parchment (*which see*) on a wooden hoop, exactly as on a drum-head, let it dry, and punch it full of small holes.

§ 6. RATIONS.—The most portable kinds of solid food are meat biscuit, pemmican, and Chollett's compressed vegetables.

Meat biscuit.—It is positively stated (see letter inserted in Hassall's "Food and its Adulterations," p. 440), that from four

to five ounces daily, boiled up with water, will support a man, to the exclusion of every other kind of food, even tea or coffee. This is probably far understated; but even doubling that allowance and throwing in $\frac{1}{4}$ lb. of Chollett's vegetables, and tea, sugar, and condiments, up to two ounces, we should have a man provisioned at the weight of 1 lb. per day. I should be very glad, indeed, to hear of this meat biscuit having been thoroughly tested. It is to be bought at Gamble's, 137, Leadenhall Street.

Pemmican.—The rude way of preparing this on the road has already been explained (p. 69). It was issued out to our Arctic expedition variously prepared, some with currants and sugar, but I do not know where it can now be bought. It is distasteful to persons who are not on hard work, and, even then, most Englishmen require condiments of some kind with it. The following table is a very valuable one: it shows what actually was consumed by probably the most energetic travelling and exploring party upon record—that of Dr. Rae. His allowance per man per day in his spring journey to the Arctic shores of America, in 1854, was,

$1\frac{1}{4}$ Pemmican	-	-	-	-	-	1·25
$\frac{1}{4}$ Biscuit	-	-	-	-	-	·25
$\frac{1}{10}$ Edward's preserved potato	-	-	-	-	-	·10
$\frac{1}{4}$ Flour	-	-	-	-	-	·33
$\frac{1}{32}$ Tea	-	-	-	-	-	·03
$\frac{1}{4}$ Sugar	-	-	-	-	-	·14
$\frac{1}{4}$ Grease or alcohol to cook with	-	-	-	-	-	·25

or 2·35 per day,

a little more than $2\frac{1}{4}$ lbs., and it required nearly as much fuel to bring the snow or ice (20° below Zero) to a liquid state as it

did to boil it afterwards. This allowance was found quite sufficient, but nothing to spare.

Chollett's preserved vegetables are admirable. A single ration weighs less than an ounce, and a cubic yard contains 16,000 of these rations. They are now to be bought at all provision merchants, as at Fortnum and Mason's, &c.

MATTERS OF DISCIPLINE.

§ 1. Even Temper.

§ 2. Organising a Party.

§ 3. In case of Death.

§ 4. Bush Laws.

§ 5. Carrying the Wounded.

§ 6. Securing Prisoners.

§ 7. Hostile Neighbourhood.

§ 1. **EVEN TEMPER.**—An exploring expedition is daily exposed to a succession of accidents, any one of which would be fatal to its further progress. The cattle may at any time stray, die, or be stolen; one or more of the men may become seriously ill, and cannot be abandoned; water may not be reached, and the party be worn out, and the cattle perish; or a hostile attack may happen. Hence the success of the expedition generally depends on a chain of minor successes, each link of which must be perfect; for where one fails, there must be an end of further advance. It is therefore well, especially at the outset of a long journey, not to go hurriedly to work and push forwards too thoughtlessly; but at leisure. Let the men and cattle be acclimatised, make the bush your home, and avoid unnecessary hardships. Interest yourself, as was remarked before, chiefly in the progress of your journey, and do not look forward to its end with eagerness. It is better to think of a return to civilisation, not as an end to hardship and a haven from ill, but as a thing rather to be regretted, and as a close to an adventurous and pleasant life. In this way, risking less, you will insensibly creep on, making connections, and learning the capabilities of the country as you advance, which will be found invaluable in case of a hurried or a disas-

trous return. And thus, when some months have passed by, you will look back with surprise on the great distance travelled over; for if you average only three miles a-day, at the end of the year you will have advanced 1000, which is a very considerable exploration. The fable of the tortoise and the hare seems expressly intended for travellers over wide and unknown tracts. It is a very high merit to have accomplished a long exploration without loss of life, of health, of papers, or even of comfort.

Tedious journeys are apt to make companions irritable one to another; but under hard circumstances a traveller does his duty well who doubles his kindliness of manner to those about him, and takes harsh words gently, and not with a retort. He should make it a point of duty to do so. It is at those times very superfluous to stand too much on punctilious terms, about keeping up one's dignity and so forth, since the difficulty does not lie in taking up quarrels, but in avoiding them. Great allowance should be made to the reluctant co-operation of servants; they have infinitely less interest in the success of the expedition than their leaders, for they derive but little credit from it. They argue thus: "Why should we strain our constitutions and peril our lives in these additional enterprises, about which we are indifferent?" It will, perhaps, surprise a leader who, having ascertained to what frugal habits a bush servant is inured, learns on trial how desperately he clings to those few luxuries which he has always had. Thus, speaking generally, a Cape servant is happy on meat, coffee, and biscuit; but if the coffee or biscuit has to be stopped for a few days, he is ready for mutiny.

§ 2. ORGANISING A PARTY.—The general duties that a servant should be bound to, independently of those for which he is specially engaged, are, under penalty of his pay being stopped,

and, it may be, of dismissal, to maintain discipline, take share of camp-duties and night-watch, and do all in his power to promote the success of the expedition. His wages should not be payable to him in full till the return of the party to the town that it started from, or to some other civilised place. It is best that all clothing, bedding, &c., that the men may require should be issued out and given to them as a present, and none of their own old clothes allowed to be taken. They are more careful of what is their own; and by supplying the things yourself, you can be sure that they are good in quality, uniform in appearance, and equal in weight, while this last is ascertainable.

The size of the party depends on many considerations. It should admit of being divided into two parts, each strong enough to take care of itself, and in each of which is some one person, at least, able to write a letter, which bush servants, excellent in every other particular, are too often unable to do. In travel through a disorganised country, where bands of marauders are about, a large party is necessary; in other cases a small one is just as good. As a general rule, small parties succeed much better than large ones; they excite less fear, do not eat up the country, and are less delayed by illness. The last fatal expedition of Mungo Park is full of warning to travellers who propose exploring with a large body of men. (*See p. 227.*)

On engaging natives, the people that they have lived with and become attached to, should impress on them that unless they bring you back in safety, they must never show their faces again, or expect the balance of their pay, which will only be delivered to them on your return.

Good interpreters are very important; men who have been used by their chiefs, missionaries, &c., as interpreters, are

much to be preferred, for so great is the poverty of thought and language among common people, that you will seldom find a man, taken at hazard, able to render your words with any correctness. Recollect to take with you vocabularies of all the tribes whom you are at all likely to visit.

Feasts.—Interrupt the monotony of travel by marked days, extra tobacco, sugar, &c. Avoid constant good feeding, but rather have frequent slight fasts to ensure occasional good feasts; and let those occasions when marked stages of your journey have been reached, be great gala days. Tobacco is the best reward for extra services.

Discountenance cliques being formed among the men, and promote merriment, singing, fiddling, and so forth, with all your power. Autolycus says, in “A Winter’s Tale,”—

“Jog on, jog on, the foot-path way,
And merrily hent the stile-a :
A merry heart goes all the day,
Your sad tires in a mile-a.”

Natives’ wives.—If some of the natives take their wives, it gives great life to the party. They are of very great service, and cause no delay, for the body of a caravan must always travel at a foot’s pace, and a woman will endure a long journey nearly as well as a man, and certainly better than a horse or a bullock. They are invaluable in packing up, and retailing information and hear-say gossip, which will give clues to much of importance that, unassisted, you might miss. Mr. Hearne, the American traveller of the last century, in his charming book, writes as follows, and I can fully corroborate the faithfulness of the way in which he gives us a native’s view of the matter. After the account of his first attempt, which was unsuccessful, he goes on to say,—“The very plan which, by the desire of the

Governor, we pursued, of not taking any women with us on the journey, was, as the chief said, the principal thing that occasioned all our wants; 'for,' said he, 'when all the men are heavy laden, they can neither hunt nor travel to any considerable distance; and if they meet with any success in hunting, who is to carry the produce of the labour?' 'Women,' said he, 'were made for labour; one of them can carry or haul as much as two men can do. They also pitch our tents, make and mend our clothing, keep us warm at night, and in fact there is no such thing as travelling any considerable distance, or for any length of time, in this country, without their assistance.' 'Women,' said he again, 'though they do everything, are maintained at a trifling expense; for as they always stand cook, the very licking of their fingers, in scarce times, is sufficient for their subsistence.'"

§ 3. IN CASE OF DEATH.—If a man of the party dies, write down a detailed account of the matter, and have it attested by the others, especially if accident be the cause of his death. If he be lost, before you turn away and abandon him to his fate, call the party formally together, and ask them if they are satisfied that you have done all that was possible to save him, and record their answers. After death, it is well to follow the custom at sea, *i. e.* to sell by auction all the dead man's effects among his comrades, deducting the money given for them from the pay of the buyers, to be handed over to his relatives on the return of the expedition. The things will probably be sold at a much higher price than they would elsewhere fetch, and the carriage of useless lumber is saved. Any trinkets he may have had, should of course be sealed up and put aside, and not included in the sale. They should be collected in presence of the whole party, a list made of them, and the articles at once packed up. In committing the body to the earth, choose

a well-marked situation, dig a deep grave, and bush it with thorns, and weight it well over with heavy stones, as a defence against animals of prey.

§ 4. BUSH LAWS.—It is impossible but that a traveller must often take the law into his own hands. Some countries are governed with a strong arm by a savage despot: then to him or his chiefs appeals would of course be made; but, for the most part, the system of life among savages is—

“The simple rule, the good old plan,—
That they should take who have the power,
And they should keep, who can.”

He will settle in his own mind what his scale of punishments should be, and it will be found a much more convenient principle for him to go on, that a culprit should be punished chiefly in proportion to the quantity of harm that he has done, rather than according to the presumed wickedness of the offence. Thus, if two men were caught, one of whom had stolen an ox, and the other a sheep, it would be preferable to flog the first much more heavily than the second: it is a way of punishing, more intelligible to savages than ours. The principle of double or treble restitution, to which they are well used, is of the same nature. If all theft be punished, your administration will be a reign of terror; for every savage, even your best friends, will pilfer little things from you whenever they have a good opportunity.

Bearing towards natives.—A frank, joking, but determined manner, joined with an air of showing more confidence to the savages than you really feel, is the best. It is observed, that a sea-captain generally succeeds in making a very good impression on natives; they thoroughly appreciate good practical common sense, and are not half such fools as strangers usually account them. If a savage does mischief, look on him as you would on a kicking mule or a wild animal, whose

nature it is to be unruly and vicious, and keep your temper quite unruffled. Evade the mischief, if you can; if you cannot, endure it; but do not trouble yourself overmuch about your dignity, or about retaliating on the man, except it be on grounds of expediency.

Wherever you go you will find kind-heartedness amongst women. Mungo Park is fond of recording his experiences of this; but I must add, that he seems to have been an especial favourite with the sex.

On arriving at an encampment, the natives commonly run away in fright. If you are hungry, or in any need of what they have, go boldly into their huts, take just what you want, and leave fully adequate payment. It is absurd to be over-scrupulous in these cases. Be very severe if any of your own party steal trifles from natives; order double or treble restitution, if the man does not know better, and if he does, a flogging besides, and not in place of it.

Drawing lots.—It is often necessary to distribute things by lot. Do it by what children call “soldiering;” one stands with his back to the rest; another, pointing to the portions in succession, calls out, “Who is to have this?” to which the first one replies by naming somebody, who at once takes possession.

§ 5. CARRYING THE WOUNDED.—If a man be wounded or sick, and has to be carried along upon the shoulders of others, make a stretcher for him in the Indian fashion; that is to say, cut two stout poles, each 8 feet long, to make its two sides, and three other cross-bars of $2\frac{1}{2}$ feet each, to be lashed to them. Then supporting this ladder-shaped framework *over* the sick man as he lies in his blanket, knot the blanket up well to it, and so carry him off, palanquin-fashion. One cross-bar will be just behind his head, another in front of

his feet, the middle one will cross his stomach, and keep him from falling out, and there will remain two short handles



for the carriers to lay hold of. The American Indians carry their wounded companions by this contrivance after a fight, and in a hurried retreat, for wonderful distances. A kind of waggon-roof top can easily be made to it with bent boughs and one spare blanket.

§ 6. SECURING PRISONERS.—To secure a prisoner with the least amount of tying, place his hands back to back behind him, then tie the thumbs together, and also the little fingers. Two bits of string, each a foot long, will thoroughly do this. But if you have not any string at hand, cut a thong from his leather apron, or tear a strip from your own linen. It is no easy matter to tie the *wrists* of a savage together so that he cannot struggle loose. His hands are often so finely made, that no cords will handcuff him. When several men have to be made fast, the usual way is to tie them, one behind another, to a long pole or rope. If a

man has to be kept prisoner all night, it is not sufficient to tie his hands, as he will be sure to watch his time and run away. It is therefore necessary to tie them round a standing tree, or a heavy log of wood. A convenient plan is to fell a large forked bough, and to make the man's arms fast round one of the branches. It is thus impossible for him to slip



away, as the fork on one side and the bushy top of the branch on the other, prevent his doing so, and notwithstanding his cramped position, it is quite possible for him to get sleep.

A strait waistcoat is the least inconvenient way to the prisoner of being secured, as his position is a free one, and the joints are not cut by cords. A makeshift for one is soon stitched together by sewing a piece of canvas into the shape

of a sleeve, and then sewing one end of this to the end of one cuff of an old jacket, and the other end to the other cuff, so that, instead of the jacket having two sleeves, it has but one long one. The jacket is then put on in the usual way, and buttoned fast in front. It is quite impossible for any struggling to break it loose. In a proper strait waistcoat the opening is behind, and the sleeves in front; it laces up behind.



To take a strong man prisoner single-handed, threaten him with your gun, and compel him to throw all his arms away, then marching him before you some little distance, make him lie flat on his face and put his hands behind him. Of course, he will be in a dreadful fright, and require re-assuring. Next take your knife, put it between your teeth, and standing over him, take the caps off your gun, and lay it down by your side. Then firmly lash his thumbs together, and afterwards more leisurely complete the handcuffing process. The reason of setting to work in this way is, that a quick supple savage, while you are fumbling with your strings, and bothered with a loaded gun, might easily spring round, seize hold of it, and quite turn the tables against you. But if the gun

had no caps on, it would be of little use in his hands, except as a club; and also, if you had a knife between your teeth, it would be impossible for him to struggle loose, without exposing himself to a thrust from it.

Tricks.—Speaking of these matters, a *ruse* should be borne in mind, that has been practised in most countries, from England to Peru. A traveller is threatened by a robber with a gun, and ordered to throw himself on the ground, or he will be fired at. The traveller, taking a pistol from his belt, shouts out, “If this were loaded you should not treat me thus!” and throws himself on the ground as the robber bids him. There he lies till the robber, in his triumph, comes up for his booty, when the intended victim takes a quick aim and shoots him dead; the pistol being really loaded all the time. I have also heard of an incident in the days of Shooter’s Hill, in England, where a ruffian waylaid and sprung upon a traveller, and holding a pistol to his breast, summoned him for the contents of his pocket. The traveller dived his hand into one of them, and silently cocking a small pistol that lay in it, shot the robber dead, firing out through the side of the pocket.

In marching off a culprit, make him walk between two of your men, while a third, carrying a gun, walks behind him. If riding alone, tie the prisoner’s hands together, and taking off your off-stirrup leather (for want of another cord), pass it round his left arm, and round your horse’s girth, and buckle it. The off-stirrup leather is the least inconvenient one to part with, on account of mounting. In cases where a prisoner has to be secured and galloped off, there are but two ways: either putting him in the saddle and strapping his ankles together under the horse’s belly, in which case, if he be mad with rage, and attempts to throw himself off, the saddle must turn with him; or else securing him Mazeppa-

fashion, when four loops are passed, one round each leg of the horse, and to each of these one limb of the prisoner, as he lies with his back against that of the horse, is tied; a surcingle is also passed round both horse and man. It is, of course, a barbarous method, but circumstances might arise when it would be of use.

§ 7. HOSTILE NEIGHBOURHOOD.—A small party has often occasion to steal through a belt of hostile country without observation. At such times, it is a rule never to encamp until long after sun-down, in order to throw out people who may be on your track. If, when you intend to encamp, you are pursuing a beaten path, turn sharp out of it, in a place where the ground is hard, and travel away for a quarter of an hour, at least; then look out for a hollow place, in the midst of an open flat. Never allow hammering of any kind, nor loud talking, but there is no objection to a fire, if reasonable precautions be taken, as it cannot be seen far through bushes. Keep a strict watch all night; the watchers should be 100 yards out from camp, and relieve one another every two hours. Enough animals for riding, one for each man, should always be tied up.

Cattle keep guard very well; a stranger can hardly approach a herd of oxen without their finding it out, for several of them are sure to be always awake and watchful. The habits of bush life make a traveller, though otherwise sound asleep, start up directly at a very slight rustle of alarm among his cattle. Scared birds often give useful warning.

A person riding a journey for his life sleeps most safely (for he *must* sometimes sleep) with his horse's head tied short up to his wrist. The horse, if he hears anything, tosses his head and jerks the rider's arm. The horse is a careful animal, and there appears to be little danger of his treading

on his sleeping master. The Indians of South America habitually adopt this plan when circumstances require extreme caution. If a troop of horsemen pass near your hiding-place, it may be necessary to clutch your steed's muzzle with both hands, to prevent his neighing.



Keeping watch.—When you think you hear anything astir, lie down and lay your ear on the ground. To see to the best advantage, take the same position; you thus bring low objects high against the sky, and make them stand in bold relief against it: besides this, in a wooded country it is often easy to see far between the bare stems of the trees, while their spreading tops quite shut out all objects a few yards off. Thus, an animal sees a man's legs long before he sees his face. An opera-glass is an excellent night-glass, and at least doubles the distance of distinct vision in the dark. I should be glad to hear that a fair trial had been also given by a traveller to an ear-trumpet.

Setting a common gun as an alarum-gun.—The gun may be loaded with bullet, or simply with powder, or only with a cap; even the click of the hammer may suffice to awaken attention; for the *way* of setting it, *see* p. 206.

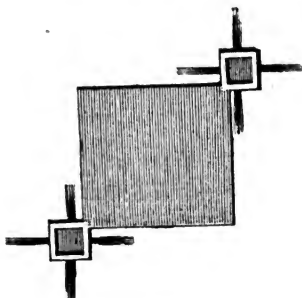
DEFENCE.

§ 1. Camp Fortification.

§ 2. Weapons.

§ 1. CAMP FORTIFICATION.—Explorers have frequent occasion to form a *depôt*, either to leave a few men in charge of the heavy luggage, while the rest of the party ride on a distant reconnoitring expedition, or else, where the whole party may encamp for weeks, until the state of the season, or other cause, may permit further travel. In either case, if in a country where hostile attempts are to be apprehended, a little forethought will vastly increase the security of the *depôt*. For instance, it should be at least 200 yards from any cover, or commanding heights; if the ground itself have any features of strength about it, as being near the side of a stream, or being on a hill, so much the better; the neighbourhood of shingle prevents any person from stealing across unheard; and, finally, the great principle of fortification suited to a small party is to form the camp into a square, and to have two projecting enclosures at opposite corners, where all the guns of the party may place themselves to fire on their assailants. It will be seen by the sketch, next page, how completely even one man, with a gun in each enclosure, can sweep the hedge as well as the whole environs of the camp. A square is better than a round shape for the enclosures, as it allows more men to use their guns at the same time on the same point; but it is so convenient to make the walls of the enclosure serve as sidings for your tent, that it would be best to let the size and shape of the tent determine those of the enclosure. A square of

nine or ten feet in the inside is amply sufficient for three guns or archers. The parapets can be easiest built of large



stones ; I do not speak of earthwork, for a travelling party has rarely spades ; but if digging be possible, then, of course, the parapet should be raised from earth thrown up by digging a trench outside it ; and the common calculation is, that, with good tools, a labourer can dig one cubic yard of earth an hour, and continue working eight hours in the day. It should be raised to a height of, at least, four feet above the ground, as that is the most convenient height to fire from, standing ; and as being high enough to shield a person kneeling down to load. Upon this parapet large stones are to be laid, having loop-holes between them, and on these stones the tent is to be pitched, its pole being lengthened by lashing a piece of wood to it, or by cutting a fresh pole altogether. It will make a high roof to the enclosure, and complete a very comfortable abode. We have thus a square enclosed camp for the cattle, the waggons, and the natives, and at opposite corners of it two fortified houses, one of which would naturally be inhabited by the leaders of the party, and the other, either by the store-keeper, or by the white servants generally.

Have a standing rule that many natives should never be allowed to go inside your camp at the same time ; it is everywhere a common practice among them to collect quietly in a friendly way, and at a given signal to rise *en masse* and overpower their hosts. Even when they profess to have left their arms behind, do not be too confident ; they are often close at hand. Captain Sturt says, that he has known Australian savages to trail their spears between their toes as they walked to him through the grass professedly unarmed.

§ 2. WEAPONS.—Unless your ammunition is so kept as to be accessible in the confusion of an attack, all your fortifying would be of little service. If the guns are all, or nearly all, of the same bore, it is simple enough to have small bags filled with cartridges, and also pill-boxes with a dozen caps in each. Otherwise, you must make the best of it. Buck-shot and slugs would be better than bullets for the purposes of which we are speaking. Bows and arrows might render good service. The Chinese, in their junks, when they expect a piratical attack, bring up baskets filled with stones from the ballast of the ship, and put them on deck ready at hand. They throw them with great force and precision. The idea is not a bad one. Boiling water and hot sand, if circumstances happened to permit their use, are worth bearing in mind, as they would tell well on naked assailants. In close quarters, thrust, do not strike ; and recollect always that it is not the slightest use to hit a negro on the head with a stick, as it is a fact that his skull endures a blow better than any other part of his person. In picking out the chiefs, do not select the men that are the most showily ornamented, for they are not the chiefs, but the biggest and the busiest.

Rockets.—Of all European inventions, nothing so impresses and terrifies savages as fireworks, especially rockets. I cannot

account for the remarkable effect they produce, but in every land the case appears to be the same. A rocket, judiciously sent up, is very likely to frighten off an intended attack and save bloodshed. If a traveller is supplied with any, he should never make playthings of them, but keep them for great emergencies.

HIDING PLACES OR CACHES.

§ 1. To make a C^âche.

§ 2. Notices to another Party.

§ 3. Secreting Jewels.

§ 1. TO MAKE A CACHE.—It is easy enough to choose a spot, which you yourself shall again recognise, for digging a hole, where stores of all kinds may be buried, against your return ; neither is it difficult to choose one, so that you may indicate its position to others, or else leave it to a party who are travelling in concert, to find it out for themselves. But excessive caution in *depositing* the stores is, in every case, required, as hungry and thieving natives keep watch on all the movements of a party ; they follow their tracks, and hunt over their old camping-places, in search of anything there may be to pick up ; and hyenas, wolves, wild dogs, and all kinds of prowling animals, guided by their sharp scent, will soon scratch up any provisions that are buried carelessly, or in such a way as to taint the earth.

Leaving aside the question of landmarks, the proper place to choose for a *câche* is a sandy or gravelly soil, on account of its dryness and the facility of digging it. Old burrows, or the gigantic hills of white ants, may be thought of, if the stores are enclosed in tin cases, and also clefts in rocks ; some things can conveniently be buried under water. The place must be chosen under such circumstances, that all signs of the ground having been disturbed can be effaced. A good plan is to set up your tent, and dig a deep hole inside it,

wrapping up what you have to bury in an oilcloth, in an earthen jar, or wooden vessel, according to what you are able to get (but not in skins, for they give out smell). Continue to inhabit the tent for at least a day, well stamping and smoothing down the soil at leisure. After this, strike the tent, shift the tethering place or kraal of your cattle to where it stood, and they will speedily efface any marks that may be left. Travellers often light their fires over the holes where their stores are buried, but natives are so accustomed to suspect fire places, that these do not prove safe dépôts. The natives in Ceylon jerk their game, put the dry meat in the hollow of a tree, fill up the reservoir with honey, and plaster it up with clay.

Large things, as a waggon or boat, must either be pushed into thick bushes or reeds, and left to chance, or they may be buried in sand, that is to say, in a sand drift, or in a sandy deposit by a river side. A small reedy island is a convenient place for *câches*.

To find your store again, you should have ascertained the distance and bearing by compass of the hole from some marked place, as a tree, about which you are sure not to be mistaken; or from the centre of the place where your fire was made, which is a mark that years will not entirely efface. If there be anything in the ground itself to indicate the position of the hole, you have made a clumsy *câche*.

It is not a bad plan, after the things are buried, and before the tent is removed, to scratch a furrow a couple of inches deep, and three or four feet long, and to lay a piece of reed, or a wand, in it. This will be easy enough to find again, by making a cross furrow, and when found, will lead you straight above the dépôt. Reeds would never excite suspicion,

even if a native got hold of them, for they would appear to have been dropped, or blown on the ground by chance, not seen, and trampled in.

Some explorers number their camps, and mark the trees with the numbers.

§ 2. NOTICES TO ANOTHER PARTY.—If a letter has to be left at a known tree, for a person who, on his passing by, it may be months after, expects to find it there, a very safe way of doing so is as follows :—Clamber up the tree when it is dark, to the first large bough, and, sitting astride it, cut with a chisel a deep hole right into the substance of the wood, or you may make one by firing a bullet down into it. If possible, the bark should not be cut quite away, but only displaced, and afterwards put back. In this hole the letter, rolled up or folded quite small, is to be pushed, and the bark nailed down over it. No savage would ever dream of looking there for it, for the tree shows no tracks, and it is impossible to see any mark from below. The letter might even be nailed flat under a piece of bark. A cut with a hatchet should be made on the tree, a yard or so below the bough, to indicate it.

It is convenient to punch letters on a thin lead plate made by melting a bullet or two, and casting them on a hot flat stone.

Marking a tree.—If you want a tree to be well scored or slashed, so as to draw attention to it without fail, fire bullets into it as a mark, and let the natives cut them out for the sake of the lead in their own way; they will do just what you want, and never suspect your real intention. When you have made a *câche*, if it be for another party who knows nothing about it, take the bearing of it from some large tree or other landmark, on which you must gash, paint, or chisel characters something of this sort:

LETTER BURIED 50 YARDS N.N.E.

which explains itself. Savages will, however, take such pains to efface any mark that they may find left by white men, entertaining thoughts like those of Morgiana in the Arabian Nights' Tales of the Forty Thieves, that it would be the height of imprudence to trust to a single mark. It is, therefore, very desirable to take a branding iron to hold letters of about a quarter of an inch in height, and to brand or stamp the tree in many places. A couple of hours spent in doing this would leave, perhaps, two dozen marks, which would be quite beyond the power of a few savages to cut out with their axes.

The Arctic system of depositing letters 10 feet *due* north (and not *magnetic* north) from the cairn or mark, is a good rule; and, failing other previous arrangements or better reasons, should be generally employed. A universal system is of so great a convenience that I trust travellers will consent to adopt this rule. Let me at least suggest that persons who find a tree marked so as to attract notice, and who are searching blindly in all directions for further clue, should *invariably* dig out and examine that particular spot. The notice that should be deposited there may simply indicate some more distant point as the actual *câche*.

These notices might be pushed into a hole bored into the head of a tent-peg, which could be driven deeply in the ground quite out of sight, and without disturbing the earth. Or it may suffice to pick up a common stone, and scratch or paint what you had to say on it, and leave it on the ground, with its written face downwards, at the place in question. A

good mark to show that Europeans have visited a spot is a saw mark (no savages use saws); it catches the eye directly. As very many good bushrangers cannot read, rude picture writing is often used by them, especially in America. The figure of a man with a spear or bow, drawn, I mean, as a child would draw, stands for a savage; one with a hat or gun, for a European; horses, oxen, sheep; lines for numbers; arrow-head for direction, and so forth. Even without other more conventional symbols, a vast deal may be expressed in this way.

Whitewash mixed with salt, or grease, or glue-size, will stand the weather for a year or more, when painted on a tree or rock, and of course the rougher the surface the longer will some sign of it remain.

Black for inscriptions cut in a rock, is made by charcoal, or, better, by lampblack, mixed in the same way with some kind of size, or with tar.

§ 3. SECRETING JEWELS.—Before going among a rich but semicivilised people, travellers sometimes buy a few small jewels, and shut them up into a little silver tube with rounded edges, then making a gash in their skin, they bury it there, allowing the flesh to heal over it. They feel no inconvenience from its presence—any more than a once wounded man does from a bullet lodged in his person, or from a plate of silver set beneath his scalp. The best place for burying it is on the left arm, at the spot chosen for vaccination. By this means, should a traveller be robbed of everything, he could still fall back on his jewels. I fear, however, that if his precious *depôt* were suspected, any robbers into whose hands he might fall would fairly mince him to pieces in search of further treasures. The jewels may be buried without the tube. Some travelling Arabs wear a chain of gold sewn up in dirty leather under their belt. (Burton.)

BOATS, RAFTS, FORDS, BRIDGES, ETC.

§ 1. Swimming Rivers.

§ 2. Rafts and Rude Boats.

§ 3. Carrying Boats overland.

§ 4. Hints for Boating excursions.

§ 5. Fords, Bridges, &c.

§ 1. SWIMMING RIVERS.—If a traveller can swim pretty well, it is a good plan to make a float, and to throw himself flat down in the water with his breast upon it, while his clothes and valuables are tied in a huge turban on his head. In this way broad streams can easily be crossed, and great distances of river descended. He may adjust paddles on to his hand. His float may be a faggot of rushes, a log of wood, or any one of his empty water-vessels; for whatever will keep water in, will also, of course, keep it out; while as to bags, the air that may ooze out through their sides may be blown afresh into them while afloat.

It is an easy matter to make an effective life-belt simply out of holland, ticking, canvas, or other similar materials; and the crews of a vessel aground some way from the mainland, and who must prepare to swim for their lives, might avail themselves of this plan: Cut out two complete rings of 16 inches outer diameter and 8 inches inner diameter, sew these together along both edges, and the chief part of the belt is made. What remains, is to sew strong shoulder-straps to it, so that by no possibility it can slip down over the hips; and, lastly, to sew a long narrow tube to it out of a strip a foot long and two inches wide, from the same material as the belt.

For the mouth of this, a bit of wood an inch long with a hole bored down its middle, should be inserted as a mouthpiece. Through this tube the belt can be inflated by the swimmer while in the water, from time to time, as often as may become necessary; and by simply twisting it and tucking its end in the belt, its vent can always be closed.

After canvas, &c., is *thoroughly* drenched, it will hold the air very fairly.

In landing through a heavy surf, wait for a large wave, and come in on the crest of it. Make every possible exertion to scramble up to some firm holding-place whence its indraught, when it returns, can be resisted. If drawn back you will be heavily battered, perhaps maimed, and certainly far more exhausted than before, and not a whit nearer to safety. Avoid receiving a breaker in the attitude of scrambling away from it on hands and knees. From such a position the wave projects a man headforemost with fearful force, and rolls him over and over in its surge. He ought to turn on his back the instant before the breaker is upon him, and then all will go well, and he will be helped on, and not half killed by it. The swimmer's valuables may be put inside the empty vessel that acts as his float. A very good life-belt is made to admit of this arrangement. It has a large opening at one end, which is closed by a brass door that shuts like the top of an inkstand, and is then quite air-tight. A small parcel, if tightly wrapped up in many folds, will keep dry for a long time though immersed in water, and the outside of it may be greased, oiled, or waxed, as an additional security.

If a person cannot swim a stroke, he should be buoyed up with floats under his arms, and lashed quite securely, and to his own satisfaction; then he can be towed across the river

with a string. If he lose courage halfway it cannot be helped, it will do him no harm, and his swimming friend is in no danger of being grappled with and drowned. For very short distances, a usual way is for the man who cannot swim to



hold his friend by the hips. A few yards of intestine blown up, and tied in five or six places, so as to make so many watertight compartments, is a capital swimming-belt, if wound in a figure of eight round a man's neck and under his armpits. A very little is enough to buoy a man's head up.

Swimming horses.—In crossing a deep river, with a horse or other large animal, drive him in, or even walk him alongside a steep bank, and push him suddenly in; having fairly started him, jump in yourself, and seizing him by the tail, let him tow you across. If he turns his head to try and change his course, splash water in his face with your right or left hand, as the case may be, holding on with one hand and splashing with the other, and you will in this way direct him just as you like. This is by far the best way of swimming a horse, all others are objectionable and dangerous—such as to swim alongside the horse, with one hand on his shoulder; or, worst of all, to retain your seat on his back. If this last method be persisted in, at least let the rider take his feet out of the stirrups before entering the water.

To float a waggon across a river, be sure that it is well ballasted, or it will assuredly capsize. The heavy contents must be stowed at the bottom, the planking must be lashed down to the axletrees, or it will float away from them; great bundles of reeds and the empty water-vessels should be lashed inside, but high above all, and then the waggon will cross without danger. When fairly started, the oxen will swim it across, pulling in their yokes.

§ 2. RAFTS AND RUDE BOATS.—Rafts are made by felling logs, letting them drift alongside one another, if they are large, securing them together by pairs of cross-bars, one of each pair lying above the raft and the other below; then,

by a little judicious notching where the logs cross, and a few pegs and lashings, the whole may be made quite firm. Briars, woodbines, &c., will do for the lashings. Outriggers vastly increase the stability of a raft.



The floating power of a raft depends on the buoyancy of the wood it is made of. I have extracted and given below a list of the specific gravities of a few well-known woods, and annexed to them a column of what may be called their "specific floating powers"—that is to say, the difference between their specific gravities and that of water, which is 1. Hence, to find the actual floating power of a raft, multiply its weight into the specific floating power of the wood it is made of, and the thing is done. Thus, a raft of 12 logs of larch averaging 30 lbs. each, weighs 360 lbs.; this multiplied by .47, is equal to 169 lbs. very nearly, which is the weight the raft will support without sinking. Poplar is the lightest on the list.

	Specific Gravities.	Specific Floating Powers.
Alder	·80	·20
Ash	·85	·15
Beech	·85	·15
Elm	·59 to ·80	·41 to ·20
Fir	·47 to ·60	·53 to ·40
Larch	·53	·47
Oak	·75	·25
„ heart of	1·17	sinks
Pine	·40 to ·63	·60 to ·37
Poplar	·38	·61
Willow	·59	·41

Where there are no means at hand to fell trees, they should be burnt down; two men may attend to the burning of twenty trees at one and the same time. When felled, their tops and branches are, also, to be trimmed by fire.

Mr. Andersson, in exploring the Tioughe River, in South Africa, met with two very simple forms of rafts; the one was simply a vast quantity of reeds cut down, heaped into a stack of from 30 to 50 feet in diameter, and pushed out into the water and allowed to float down stream. Each day, as the reeds became water-logged, more were cut and thrown on the stack. On an affair of this description, Mr. Andersson, with seven attendants, and two canoes hauled up upon it, descended the river for five days. Its great bulk made it sure of passing over shallow places, and when it struck against “snags,” the force of the water soon slewed it round and started it afresh. The second reed raft was a small and neat one, and used for ferries. A mattress of reeds was made, about 5 feet long, 3 broad, and some 8 inches thick; it was tied together with strips of the reeds themselves; to each of its four corners was fixed a post made of an upright faggot of reeds, about 18 inches high, and other faggots connected their tops

horizontally in the place of rails; this was all; it held one or two men, and nothing but reeds or rushes were used in its construction.

Hides simply inflated.—"A single ox-hide may be made into a float capable of sustaining about 300 lbs.; the skin is to be cut to the largest possible circle, then gathered together round a short tube, to the inner end of which a valve, like that of a common pair of bellows, has been applied; it is inflated with bellows, and as the air escapes by degrees, it may be refilled every ten or twelve hours." (Handbook for Field Service.)

We read of the skins of animals stuffed with hay to keep them distended, having been used by Alexander the Great, and by others.

Goatskin rafts are extensively used on the Tigris and elsewhere. These are inflated through one of the legs; they are generally lashed to a framework of wood, branches, and reeds, in such a way that the leg is accessible to a person sitting on the raft; when the air has in part escaped, he can creep round to the skins one after the other, untying and re-inflating them in succession.

An inflatable indian-rubber boat is an invention which has proved invaluable to travellers; they have been used in all quarters of the globe, and are found to stand every climate. A full-sized one weighs only 40 pounds. They have done especial service in Arctic exploration; and the waters of the Great Salt Lake, in the Mormon country, were first explored and navigated with one by Colonel Frémont; they have also been recently employed by Dr. Livingston in South Africa. They stand a wonderful deal of wear and tear; still, as boats, they are inferior to native canoes, as they are very slow in the water. It is, indeed, impossible to paddle them against a moderate head-wind. For the general purposes of travellers,

I should be inclined to recommend as small a mackintosh-boat as can be constructed, just sufficient for one, or at most for two, persons, such as the cloaks that are made inflatable and convertible into boats. I do so because it is rare to find a large piece of water without natives' canoes. What a traveller chiefly wants is to be able to cross over to a village and call for help, or else a means of carrying his valuables across a river, while the heavy things are risked at a ford ; or for shooting, fishing, or surveying. Now a very small inflatable pontoon would do as well for all these purposes as a large one, and would be far more portable. Such a one would weigh 10 lbs.

Captain Fitzroy gives an account of a party of his sailors, whose boat had been stolen while they were encamped, putting out to sea in a large basket, woven with such boughs as were at hand, and covered with their canvas tent, the inside of which they had puddled with clay, to keep the water from oozing through too fast. They were 18 hours afloat in this crazy craft. I mention this instance to show how almost anything will make a boat. Canvas saturated with grease or oil is waterproof, and painted canvas is excellent for a boat.

A hide boat is a good contrivance; and if the hide be smoked (see p. 144) after it is set, it is said to be vastly improved. In its simplest form Peruvian travellers describe it as a dish or tray consisting of a dry hide pinched up at the four corners, and each corner secured with a thorn. The next plan in simplicity is that of making eyelet holes round its rim, passing a thong through, and drawing it pretty close, while it is kept in shape by sticks put inside and athwart its bottom.

If a traveller has command of one hide only, he should make a coracle ; if of two, a punt. This last is a really useful

boat, one in which very great distances of river may be descended with safety, and much luggage taken. Hide boats are very light, since the weight of a bullock's skin only averages 45 pounds, but they soon rot. When taken out of the water they should be laid bottom upwards to dry. To make a proper and substantial coracle, a dozen or more osier or other wands must be cut; these are to be bent, and have both ends stuck in the ground, in such a way as to form the framework of the required boat, bottom upwards, whose shape is much like half a walnut-shell, but more flattened. Where these wands cross they should be lashed, and where there appears to be an unfilled part, a stick should be wattled in. All this being completed, a raw hide is to be thrown over it, sewn in place, and left to dry. Finally, the projecting ends of the osiers have to be cut off. Should this boat, by any chance, prove a failure, the hide is not wasted, but can be removed, soaked till soft, and used again.

A punt requires two bullocks' or other hides, and also, at least, a couple of thin poles of tough wood 14 feet long. To make it, these poles are laid a little apart and parallel to each other, and there secured with a few cross pieces, ladder fashion. Twenty inches from each of their ends a notch must be cut, halfway through the poles, to enable the ends to be bent upwards, in order to form a sharp stem and stern to the punt. Knees of wood, bent over the fire, have now to be lashed on, and very little additional strengthening is required; what is used must depend on the means at hand and the judgment of the builder. The reeking or soaked hides have lastly to be thrown over the frame, turned bottom upwards. Mr. Palliser says that two days is sufficient for two people to complete an entire punt of this description.

Instead of using leather, the punt may be planked over, if

the traveller has patience and means to cut plank, and has nails. Anything does for caulking the seams. The inner bark of trees, steeped and pounded, is the readiest material. In default of nails, the planks *can* have holes bored in them and be sewn together with strips of hide, woodbine, or string made from the inner bark or fibrous roots of trees.

“From a pine, or other tree, take off with care the longest possible entire portion of the bark; while fresh and flexible, spread it flat as a long rectangular sheet; then turn it carefully up at the sides, the smooth side outwards; *sew* the ends together, and caulk them well. A few cross sticks for thwarts complete this contrivance, which is made by an American Indian in a few hours, and in which the rapid waters of the Mackenzie are navigated for hundreds of miles. Ways of strengthening the structure will readily suggest themselves. The native material for sewing is the fibrous root of the pine.” (“Handbook for Field Service;” Capt. Lefroy.)

Birch bark, as is well known, is used for building canoes in North America, and that also of many other trees would do for covering the framework of a boat, in default of leather. But it is useless to give a detailed account of birch canoes, as great skill and neat execution are required both in making and in using them.

A wooden canoe is best made by hollowing out a long tree, by axe and by fire, and fastening an outrigger to one side of it, to give steadiness in the water.

It is easy, but tedious, to burn out hollows in wood; the fire is confined by wet earth from extending too far to the side, and the charred matter is from time to time cleared away, and fresh fire raked back on the exposed surface.

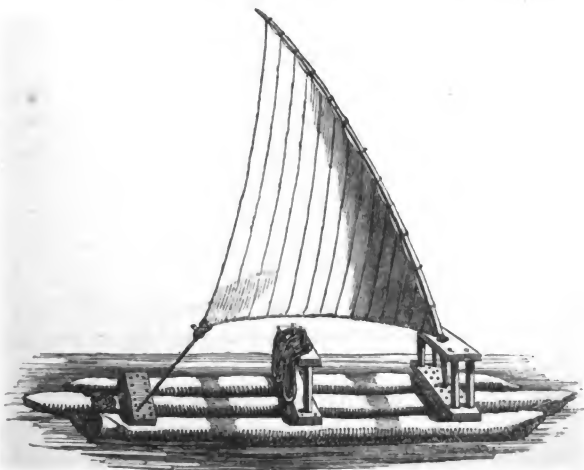
Mr. Gilby informs me that he has travelled with a pair of light sculls and outrigger irons; he could adapt them to

many kinds of rude boats and found them very useful in Egypt.

Keels are always troublesome to make: lee-boards are the best things for a rude boat or punt if you want her to carry sail; and a rude oar makes the best rudder.

§ 3. CARRYING BOATS OVERLAND.—English-made boats have been carried by explorers for great distances on wheels; they seldom seem to have done much useful service. They would travel easiest if slung and made fast in a strong wooden crate or framework, which is fixed on to the body of the carriage. A white covering is necessary, and they should be frequently looked at. Mr. Richardson and his party took a boat, in four portions, on camel-back across the Sahara, all the way from the Mediterranean to Lake Tchad.

Copper boats have been much recommended, because an accidental dent, however severe it may be, can be beaten out



without injury to the metal. One of Mr. Lynch's boats was of copper, when he surveyed the Jordan.

If you have an ordinary boat, and wish to make it of greater burthen, saw it in half and lengthen it. Comparatively coarse carpentering is good enough to do this efficiently.

A simpler sailing boat could hardly be contrived than that shown in the sketch, and used by the Brazilian fishermen. The anchor is made of two pieces of wood lashed together, and weighed with a stone.



Where there is difficulty in "stepping" a mast, use a bar across the thwarts, and two poles, one lashed at either end of it, and coming together to a point above. This triangle takes the place of the masts, and is secured by shrouds fore and aft. This is a very convenient rig for a boat with an outrigger. The Sooloo pirates use it.

§ 4. HINTS FOR BOATING EXCURSIONS.—To haul up a boat on a barren shore with but a few hands, lay out the anchor ahead of her to make fast your purchase to ; or back the body of a waggon underneath the boat as she floats, and so draw her out upon wheels.

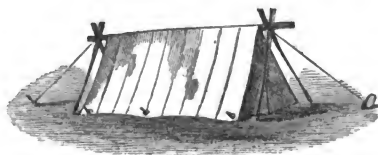
If caught by a gale, recollect that a boat will lie-to and live through almost any weather if you can make a bundle of a few spare spars, oars, &c., and secure them to the boat's head, so as to float in front of and across the bow. They will act very sensibly as a breakwater, and the boat's head will always be kept to wind. By making a canvas half-deck to an open boat, you much increase its safety in broken water, and if

it be made to lace down the centre, it can be rolled up on the gunwale, and be out of the way in fine weather.

In floating down a stream when the wind blows right against you (and on rivers, the wind nearly always blows right up or right down), a plan generally employed is to cut large branches, and to make them fast to the front of the boat, to weight them that they may sink low in the water, and to throw them overboard. The force of the stream on these will more than counterbalance that of the wind upon the boat. For want of branches, a kind of water-sail is sometimes made of canvas.

Awning.—The best is a waggon-roof awning, made simply of a couple of parallel poles, into which the ends of the bent ribs of the roof are set, without any other cross-pieces. This roof should be of two feet larger span than the width of the boat, and should rest upon prolongations of the thwarts, or else upon crooked knees of wood. One arm of each of these knees is upright and is made fast to the inside of the boat, while the other is horizontal and projects outside it. It is on these horizontal and projecting arms that the roof rests, and to which it is lashed. Such an awning is airy, roomy, and does not interfere with rowing if the rollocks are fixed to the poles. It also makes an excellent cabin for sleeping in at night.

A boat's sail is turned into a tent by erecting a gable-shaped framework, the mast or other spars being the ridge pole,



and a pair of crossed oars lashed together supporting it at either end, and the whole is made stable by a couple of ropes and pegs. Then the sail is thrown across the ridge pole (not over the crossed tops of the oars, for they would fret it) and is pegged out below. The natural fall of the canvas closes up the two ends, as with curtains.

Tree-snakes.—There are rivers with overhanging branches, down which travellers should beware of keeping too near in-shore, lest the rigging of his boat should brush down tree-snakes into it.

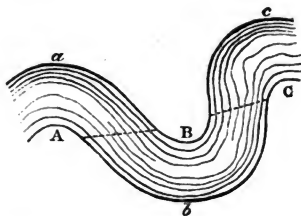
Buoys.—An excellent buoy is simply a small pole, anchored by a rope at one end. It is very easily seen, and exposes so little surface to the wind and water that it is not easily washed away. A pole the thickness of a walking-stick is much used in Sweden. Such a buoy costs only a rope, a stick, and a stone; a tuft of the small branches may be left on the top.

§ 5. FORDS AND BRIDGES.—In fording a swift stream, carry heavy stones in your hand, for you require weight to resist its carrying you away; indeed, the deeper you wade the more weight you require, though you have so much the less at command, on account of the water buoying you up.

Fords must not be deeper than 3 feet for men, or 4 feet for horses. When there is a boat, they can be found by tying a sounding-pole to its stern, rowing down the middle of the stream, and searching those places where the pole touches the bottom.

Otherwise, fords should be tried for where the river is broad rather than where it is narrow, and especially at those places where there are bends in its course. In these, the line of shallow water does not run straight across, but follows the direction of a line connecting a promontory on one side to

the nearest promontory on the other, as in the drawing; that is to say, from A to B, or from B to C, and *not* right across from B to b, from A to a, or from C to c. Along hollow curves, as at a, b, c, the stream runs deep, and usually beneath over-



hanging banks; whilst in front of promontories, as at A, B, and C, the water is invariably shoal, unless it be a jutting rock that makes the promontory. Therefore, by entering the stream at one promontory, with the intention of leaving it at another, you ensure that at all events the beginning and end of your course shall be in shallow water, which you cannot do by attempting any other line of passage.

Flying bridges are well known; a long cord or chain of poles is made fast at one end to a rock in the middle of a river, and at the other end to the ferry boat, which by being slewed so as to receive the force of the current, obliquely traverses the river from side to side, backwards and forwards.

Passing from hand to hand.—When many things have to be conveyed across a piece of abominably bad road, as over sand-dunes, heavy shingle, mud of two feet deep, a morass, a jagged mountain tract, or over stepping-stones in the bed of a rushing torrent, it is a great waste of labour to make laden men travel to and fro with them. It is a severe exertion to walk at all under these circumstances, letting alone the labour of also carrying a burden. The men should be placed in a

line, each six or seven feet from his neighbour, and pass the things from hand to hand, as they stand still.

Swamps.—To take a waggon across a deep miry and reedy swamp, outspan and let the cattle feed. Then cut faggots of reeds, and strew them thickly over the line of intended passage. When plenty are laid down, drive the cattle backwards and forwards over, and they will trample them in. Repeat the process two or three times, till the causeway is firm enough to bear the weight of the waggon. Or, in default of reeds, cut long poles and several short cross-bars, say of two feet long; join these as best you can, so as to make a couple of ladder-shaped frames. Place these across the mud, one under the intended track of each wheel. Faggots strewn between each round of the ladder will make the causeway more sound. A succession of logs put crosswise with faggots between them will also do, but not so well.

Bridges.—If you are at the side of a narrow but deep and rapid river, on the banks of which trees grow long enough to reach across, one or more should be felled, confining the trunk to its own bank, and letting the current force the head round to the opposite side, but if “the river be too wide to be spanned by one tree, and that two or three men can in any manner be got across, let a large tree be felled into the water on each side and placed close to the banks opposite to each other, with their heads lying up streamwards. Fasten a rope to the head of each tree, confine the trunks, shove the heads off to receive the force of the current, and ease off the ropes, so that the branches may meet in the middle of the river, at an angle pointing upwards. The branches of the trees will be jammed together by the force of the current, and so be sufficiently united as to form a tolerable communication, especially when a

few of the upper branches have been cleared away. If insufficient, towards the middle of the river, to bear the weight of men crossing, a few stakes, with forks left near their heads, may be thrust down through the branches of the trees to support them." (Sir H. Douglas.)

Weak ice.—Water that is slightly frozen is made to bear a heavy waggon by cutting reeds, strewing them thickly on the ice, and pouring water upon them ; when the whole is frozen into a firm mass, the process must be repeated.

LINE OF ROAD ACROSS COUNTRY.

§ 1. Plank roads.

§ 2. Roads, to mark and find.

§ 3. Accidents by the way.

§ 4. Points of the Compass.

§ 5. Climbing.

§ 1. PLANK ROADS.—“Miry, boggy lines of road, along which people had been seen for months crawling like flies across a plate of treacle, are suddenly, and I may almost say magically, converted into a road as hard and good as Regent Street by the following simple process, which is usually adopted as soon as the feeble funds of the young colony can purchase the blessing.

“A small gang of men with spades and rammers quickly level one end of the earth road.

“As fast as they proceed, four or five rows of strong beams or sleepers, which have been brought in the light waggons of the country, are laid down longitudinally, 4 or 5 feet asunder, and no sooner are they in position than, from other waggons, stout planks, touching each other, are transversely laid upon them. From a third series of waggons a thin layer of sand or grit is thrown upon the planks, which instantly assume the appearance of a more level McAdam road than in practice can ever be obtained.

“Upon this new-born road the waggons carrying the sleepers, planks, and sand, convey, with perfect ease, these three descriptions of materials for its continuance. The work

advances literally about as fast as an old gouty gentleman can walk, and as soon as it is completed there can scarcely exist a more striking contrast than between the two tenses of what it was, and what it is.

“This ‘plank road,’ as it is termed in America, usually lasts from eight to twelve years, and, as it is found quite unnecessary to spike the planks to the sleepers, the arrangement admits of easy repair, which, however, is but seldom required.” (Sir Francis Head in *Times*, Jan. 2, 1855.)

§ 2. ROADS, TO MARK AND FIND.—What is termed in bush language a “blaze” is nothing more than notches or slices cut off the bark of trees to mark the line of road. These blazes are of much use as finger-posts on a dark night. They are best made by two persons; one chipping the trees on his right, and the other those on his left. If the axes are quite sharp they only need to be dropped against the tree in order to make the chip. Doing so hardly retards a person in his walking.

The earth of an old and well-trodden road has a perceptible smell, from the dung, &c., of animals passing over it. It is usual at night, when a guide doubts whether or no he is in the track, to take up handfuls of dirt and smell it. It is notorious that cattle can smell out a road.

Where the track is well marked, showers of sparks, struck with a flint and steel, are sufficient to show it, without taking the pains of making a flame.

If you arrive at the steep edge of a ridge, and have to take your caravan down into the plain, and there appears a likelihood of difficulty in finding a road, descend first yourself as well as you can, and seek about for a good road as you climb back again. It is far more easy to succeed in doing this as you ascend than as you descend, for the reason, that when at the

bottom of a hill, its bold bluffs and precipices face you, and you can at once see and avoid them; but when at the top of the hill, these are precisely the parts that you overlook and do *not* see.

Before leaving a well-known track and striking out at night into the broad open plain, notice well which way the wind blows as regards the course you are about to pursue.

§ 3. SIGNALS.—To attract the notice of a division of your party five or even ten miles off, glitter a bit of looking-glass



in the sun towards where you expect them to be. It is quite astonishing at how great a distance its flashes will catch the sharp eyes of a bushman who has learnt to know what it is. It is now a common signal in the North-American

prairies. The sparks from a well-struck flint and steel can be seen at an equal distance. (Sullivan.)

If, instead of flashing with the mirror, the glare be steadily directed to where the party are, it will be seen at a far greater distance and appear as a brilliant star. But it requires some practice to do this well. The rays from the mirror, whatever its size may be, form a cone whose vertical angle is no greater than that subtended by the diameter of the sun, and it is therefore necessary that the signaller should be satisfied that he throws his flash within that degree of accuracy. He had better put a stick at twenty paces in front of him and shade it from the sun, and then by watching the play of the glitter on the stick, he can tell how and where he is flashing.

In short reconnoitring expeditions with a small detachment of a party, the cattle or dogs are often wild, and certain to run home to their comrades on the first opportunity, and in the event of not being able to watch them, owing to accident or other cause, advantage may be taken of their restlessness by tying a note to one of their necks, and letting them go and serve as postmen, or rather as carrier-pigeons.

Fire beacons, hanging up a lantern, setting fire to an old nest high up in a tree, make night signals; but they are never to be depended on without previous concert, as bushes and undulations of the ground may often hide them entirely. The smoke of fires by day is seen very far, and green wood and rotten wood makes the most smoke. In the old-fashioned semaphores, or telegraphs, with arms to them, it is a common rule to allow for the length of the arms one foot for every mile it is intended to be seen from, and the eye is supposed to be aided by a telescope.

A line of men can be turned into a line of semaphores by making them each hold a cap or something black and large in

their hands, and mimic the movements of one another. Only a few simple signals could be transmitted in this way with any certainty. A kite has been suggested as a day-signal, and also a kite with some kind of squib let off by a slow light and attached to its tail, as one by night. (Col. Jackson.)

A common signal for a distant scout is, that he should ride or walk round and round in a circle from right to left, or else in one from left to right.

“At other times they will lie concealed near a road, with scouts in every direction on the look out, yet no one venturing to speak, but only making known by signs what he may have to communicate to his companions or leader. Thus he will point to his ear and foot on hearing footsteps, to his eyes on seeing persons approach, or to his tongue if voices be audible; and will also indicate on his fingers the numbers of those coming, describing also any particulars as to how many porters, beasts of burden or for riding, there may be with the party. (Parkyns.)

§ 4. ACCIDENTS BY THE WAY.—If you fairly lose your way in the dark, do not go on blundering hither and thither till you are exhausted, but make a comfortable bivouac, and start at daybreak fresh on your search.

The banks of a watercourse, which is the best of clues, afford the worst of paths, and are quite unfit to be followed at night. The ground is always more broken in the neighbourhood of a river than far away from it, and the vegetation is more tangled. An exploring party travels easier by keeping far away from the banks of streams; they have fewer broad tributaries and deep ravines to cross.

If in the daytime you find that you have quite lost your way, set systematically to work to find it. I mean that you should from that moment keep a careful log, by observing and

writing down the directions in which you ride, and the time and estimated distances; else you may wander away from all help. The object, if you cannot follow back your tracks, is to ride in a circle, until the path of the caravan is crossed. First calculate coolly how far, at the utmost, you can be from your party—you have been so many hours riding, and at such and such paces, since you left them. Then make this distance the radius of your circle or “cast,” and keep to your system pretty carefully. Thus, if you ride to one side, hoping to find some clue, and do not, ride back again in a sloping direction, and regain the circle further on. In fine, if you have lost your way at all, do not make the matter doubly perplexing by wandering further: and be careful to ride in such places as to leave clear tracks behind you. Marks scratched on the ground to tell the hour and day that you passed by, will guide a relieving party.

A man who loses himself, especially in a desert, is sadly apt to find his presence of mind forsake him, the sense of desolation is so strange and overpowering; but he may console himself with the statistics of his chance, viz. that travellers, though constantly losing their party, have hardly ever been known to perish unrelieved.

Faintly-marked paths over grass (blind paths) are best seen from a distance.

Prairie on fire.—The line of fire, when the grass is below the knee, is so narrow that a man could almost jump across it. Even if a line of 12 feet broad be burnt, it is sufficient to stop the progress of the fire. Travellers accordingly do this to the windward of their camp, beating down the fire with blankets if it extends too far, and then the camp is made secure and the grass is saved for the cattle. (Palliser.)

§ 5. CLIMBING, &c. —A notched pole or a knotted rope makes

a ladder. Colonel Jackson, in his book "How to Observe," gives the following directions for climbing palm-trees and others with very rough barks:—"Take a strip of linen, or two towels or strong handkerchiefs tied together, and form a loop at each end for the feet to pass tightly into without going through; or for want of such material make a rope of grass or straw in the same way. The length should embrace a little more than half of the diameter of the trunk to be climbed. Now, being at the foot of the tree, fix the feet well into the loops, and opening the legs a little, embrace the tree as high up as you can. Raise your legs, and pressing the cord against the tree with your feet, stand, as it were, in your stirrups, and raise your body and arms higher; hold fast again by the arms, open the legs, and raise them a stage higher, and so on to the top. The descent is effected in the same way, reversing, of course, the order of the movements. The ruggedness of the bark, and the weight of the body pressing diagonally across the trunk of the tree, prevent the rope from slipping. Anything, provided it be strong enough, is better than a round rope, which does not hold so fast. A little practice will soon render this mode of climbing perfectly easy." We hear of people who have tied sheets together to let themselves down from windows, &c., when making an escape. The best way of making a long rope from sheets is to cut them into strips of about 6 inches broad, and with these to twist up a two-stranded rope.

Leaping poles, &c.—In France they practise a way of crossing a deep brook by the help of a rope passed round an overhanging branch of a tree growing by its side. They take a run and swing themselves across pendulum fashion. It is, in fact, the principle of the leaping pole, reversed.

§ 6. POINTS OF THE COMPASS.—The confusion between true

and magnetic bearings is puzzling and endless. Sir Thos. Mitchell's exploring party nearly sustained a loss by mistaking one for the other. I should certainly recommend that the points of the compass, *viz.* North, N.N.E., &c., should be used for none except true bearings; and that the degrees, as 25° (or N. 25° E.), for none except magnetic. There is no reason why the two nomenclatures should interfere with one another, for a traveller's recollection of the lay of a country depends entirely upon true bearings—on sunrise, sunset, and the stars; but his surveying data, which find no place in his memory, but are simply consigned to his note-book, are invariably registered in degrees. To carry out this principle I should advise a little round of paper to be pasted in the middle of the traveller's pocket-compass card, almost large enough to hide the rhumbs in the centre of it, but leaving the degrees round its rim quite untrampled upon. On this the points of the compass should be so marked as to be as true as possible for the country about to be visited.

It will be found a great advantage to have the bottom of the compass, as well as the top, made of glass, and an arrow-head cut in the card parallel to the due north and south line; for at night, by holding up the compass between the eye and the sky, the position of the cut can plainly be seen. Otherwise in the dark, which is precisely the time when a compass is most needed, it is impossible to consult it; the light of a pipe or cigar being insufficient. The pivot on which the card turns can be fixed in a hole drilled through the bottom glass, but I have found it better to have it fixed into a slight cross-bar, which the bottom glass protects from injury.

Bearings by moss, &c.—The moss that grows strongest on the north side of firs and other trees, in the latitude of Europe,

gives, as is well known, a clue by which a course may be directed through a forest. For, looking on the surrounding masses of trees, much more moss will be observed in some one direction than in any other, and that moss, lying as it does on the north side of the several trees, is of course due south with reference to the observer. And as he walks on, and fresh trees come constantly in sight, he is able to correct any slight error of direction into which the peculiarities of particular trees may at first have led him.

The Siberians travel guided by the ripples in the snow, which run in a pretty fixed direction, owing to the prevalence of a particular wind. The ripples in a desert of sand are equally good as guides, or the wind itself, if it happens to be blowing, especially to a person pushing through a tangled belt of forest.

It requires very great practice to steer well by stars, for, on an average, they change their bearings even faster than they change their altitudes. In tropical countries the zodiacal stars, as Orion and Antares, give excellent east and west points. The Great Bear is useful, when the North Pole cannot be seen, for you may calculate by the eye whereabouts it would be in the heavens when its "pointers" were vertical, or due north; and the Southern Cross is available in precisely the same way.

In the old days, coasting sailors sometimes took pigeons with them, and when at fault, let one fly, which it did at once to the land.

An almanack, calculated to show the bearing, and not only that, but also the time of moonrise and moonset for the country travelled over, as well as those of sunrise and sunset, is a very great convenience. (See *Instruments*.)

The following diagram is intended to be traced out in lines of different colours, when it will be found to be far less confused than it now appears to be.

Its object is to enable a traveller to use the sun, both as a rude watch and as a compass. It is calculated for the latitude of London, but will do with more or less accuracy for the whole of England. A traveller to other countries may draw up a sufficiently complete one, and on a larger scale, if he prefers it, for himself, by using the Azimuth tables and the Horary tables of Lynn.

The diagram represents, 1st, circles of equal altitudes; 2ndly, the path of sun, stars, &c., for each 10th degree of declination; 3rdly, the hour angles, all projected down upon, 4thly, the level compass card.

Thus, six circles are drawn round the centre of the compass card at equal distances apart, each ring between them representing a space of 15° in altitude.

The following was then calculated for each 10th degree of declination in turns, viz. :—What is the height of the sun, &c., at each point of the compass that is crossed by it, when above the horizon? 2ndly, what is the bearing of the sun at each consecutive hour? These points were all dotted out; and by joining the several sets of them, the card was drawn.

The broken lines which radiate in curves from P, are the hour lines; those which surround P in more or less complete ovals, are the paths of the sun, &c., for each 10th degree of declination, the prominent line running from E. round to W., being its path when on the Equator.

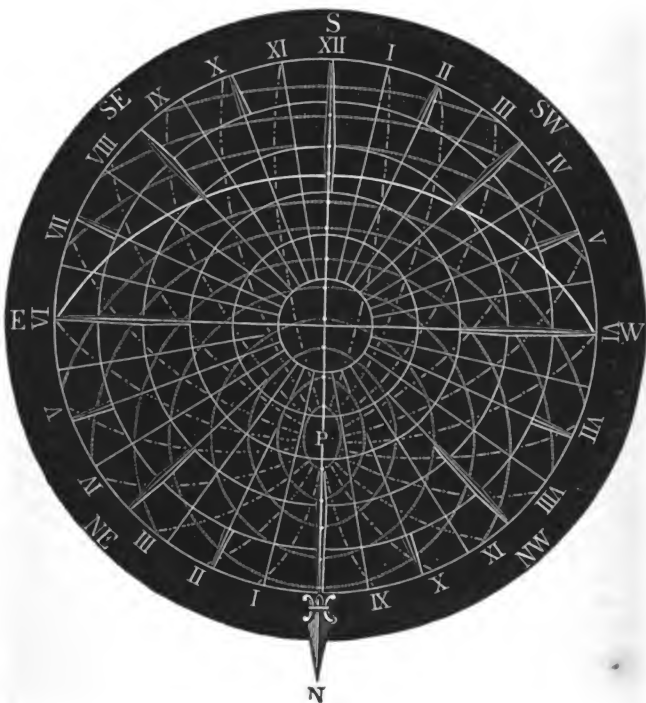
The diagram, when it is traced out for use, should have the names of the months written in coloured ink on either side of the south line at places corresponding to the declination of the sun during those months; viz. :—

Jan.	S. 23°	to	S. 17°	July	N. 23°	„	N. 18°
Feb.	S. 17	„	S. 8	Aug.	N. 18	„	N. 8
March	S. 7	„	N. 4	Sept.	N. 8	„	S. 3
April	N. 5	„	N. 15	Oct.	S. 3	„	S. 14
May	N. 15	„	N. 22	Nov.	S. 15	„	S. 22
June	N. 22	„	N. 23	Dec.	S. 22	„	S. 23

To use the traced out card.—Begin by drawing a broad pencil line, which may afterwards be rubbed out, corresponding to the date of travel, and there will be no further confusion.

Then, to know what o'clock it is, “span out” roughly the altitude of the

sun, and when the altitude obtained crosses the pencil mark, there will be the position of the sun. The hour is at once read off; and the compass, card is adjusted by holding it level, and turning it round until a line, drawn from its centre through the point in question, points towards the sun.



As to the moon or a star, if its declination be unknown, but its bearing and altitude be given, its declination and path will be found, and therefore the time since its rising or before its setting; a most useful piece of information to a traveller.

Watches break, and compasses cannot be used on the road without stopping, and therefore this diagram, of which any number of copies may be traced out, is recommended for common rough purposes.

HEAVY BODIES, TO MOVE.

§ 1. Heavy bodies, to move.

§ 2. Knots.

§ 3. Substitutes for String and Cord.

§ 1. ANY HEAVY BODY can be raised by levering up its ends alternately, and building underneath them when lifted up. After a sufficient height has been gained, it is often practicable to build a sloping causeway down to the place to which the mass has to be moved, and along which it may be dragged, with the assistance of rollers and grease. If the mass be too awkwardly shaped to admit of this, it may at all events be raised by passing poles underneath it, and raising the ends of these poles alternately. Mr. Williams, the well-known missionary of the South Sea Islands, relates how his schooner of from 70 to 80 tons had been driven by a violent hurricane and rising of the sea on one of the Islands near which it was anchored, and was lodged several hundred yards inland; and thus describes how he got her back:—

“The method by which we contrived to raise the vessel was exceedingly simple, and by it we were enabled to accomplish the task with great ease. Long levers were passed under her keel, with the fulcrum so fixed, as to give them an elevation of about 45 degrees. The ends of these were then fastened together with several cross-beams, upon which a quantity of stones were placed, the weight of which gradually elevated one end of the vessel, until the levers reached the ground. Propping up the bow thus raised, we shifted our levers to the stern, which was in like manner elevated; and by repeating this process three or four times, we lifted her in one day entirely out of the hole (which she had worked for herself,

and which was about four feet deep). The bog that lay between her and the sea was then filled up with stones, logs of wood were laid across it, rollers were placed under the vessel, the chain cable passed round her, and by the united strength of about 2000 people, she was compelled to take a short voyage upon the land, before she floated in her pride on the sea." (Williams' "Missionary Enterprise.")

In some cases, the body of a cart may be taken down, and deep ruts having been dug on each side of the mass, the wheels can be backed, till the axletree comes across it; then lashing and making fast, the mass can be drawn away upon wheels.

Parbuckling.—A round log or a barrel is to be rolled, not dragged; and many irregularly-shaped objects may have bundles of faggots lashed round them, by which they become barrel-shaped and fit to be rolled. In these cases, parbuckling gives a double purchase; one or more ropes have one of each of their ends made fast in the direction to which the log has to be rolled, while the other is carried underneath the log, round it, and back again. By pulling at these free ends the log will be rolled on. An equivalent plan, and in some cases a more practicable one, is to make fast one end of the rope to the log itself, then, winding the rope two or three times round it, like cotton on a reel, to haul at the free end as before. Horses can be used, as well as men, for this work.

The huge blocks of marble quarried at Carrara are shipped in the small ships of the country as follows: at low water the vessel is buried bodily in the sand, and a temporary railway laid down from the quarry to withinside of it. Along this the blocks are conveyed, and when deposited in the ship the sand is dug away from under them, and they settle down into its hold, and the ship floats away at the returning tide.

If the weight be in water, a boat, raft, &c., may be brought over it and sunk to its gunwales; then making fast, the boat can be baled and the thing floated away.

“Although from its bulk several men might be puzzled to lift a cow-fish from the water when dead, yet one single Indian will stow the largest in his montaria without assistance. The boat is sunk under the body, and rising, the difficult feat is accomplished.” (Edward’s “Amazon.”)

In some cases, a raft may be built round the mass, which can be floated away by the tide, or a flush of water; or a sledge may be built under it, upon which it may be dragged away by a team.

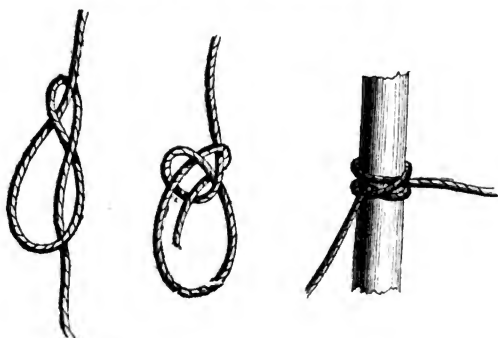
South American Indians are said to avail themselves of their forest trees, and the creepers which stretch from branch to branch, in moving very heavy weights, as in lifting a log of timber up on a stage to be sawn, in the following ingenious manner. The labourer gets hold of one of these creepers that runs from the top boughs of a tree in the direction in which he wants to move his log, and pulling this creeper home with all his force, bending down the bough, he attaches it to the log; then he goes to another creeper, and does the same with that; and so on until he has the combined strain of many bent boughs urging the log forward, and of sufficient power to move it.

§ 2. KNOTS.—The three elementary knots, which every one should know, are here represented; viz., the Timber-hitch, the Bowline, and the Clove-hitch.

The virtues of the Timber-hitch are, that, so long as the strain upon it is kept up, it will never give; when the strain is taken off, it is cast loose immediately.

The Bowline makes a knot difficult to undo; with it the ends of two strings are tied together, or a loop made at the

end of a single piece of string, as in the drawing. For slip-nooses, use the bowline to make the draw-loop.



The Clove-hitch binds with excessive force, and by it, and it alone, can a weight be hung to a smooth pole, as to a tent pole. A kind of double clove-hitch is generally used, but the simple one suffices, and is more easily recollected.

§ 3. SUBSTITUTES FOR STRING AND CORD.—Thongs cut spirally, like a watch-spring, out of a piece of leather or hide, and made pliant by working them round a stick.

Catgut, &c., *see* p. 145.

Inner bark of trees: this is most easily separated by long steeping in water.

Roots of trees, as the spruce fir, split to the proper size.

Woodbines, runners, or pliant twigs twisted together.

Hay-bands.

Horse-hair ropes.

Pulleys and blocks do not fall within the province of this book. They require what travellers can rarely get, abundance of good rope and a place to make fast to.

CARPENTRY AND SMITH'S WORK.

§ 1. Tools and Fixtures.

§ 2. Lashings of Raw Hide.

§ 3. Seasoning and bending Green
Wood.

§ 4. Bark, to procure.

§ 5. Blacksmith's Work.

§ 6. Tinsmith's Work.

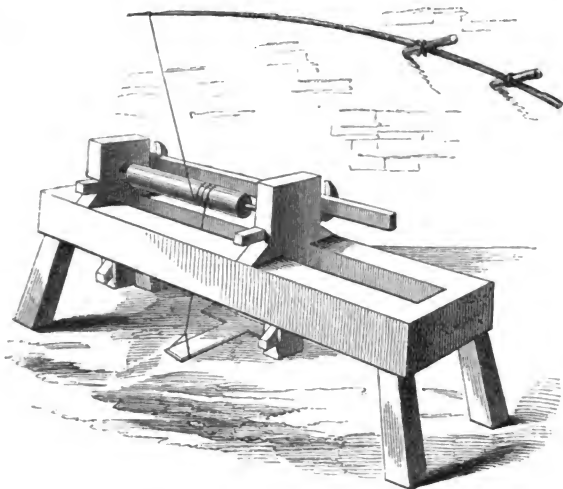
§ 1. TOOLS AND FIXTURES.—A great deal of joinery can be done with a small axe with a hammer-head, a very small single-handed adze, a mortise chisel, a strong gouge, a couple of medium-sized gimlets, a few awls, a small Turkey-hone, and a whetstone. If any saw be taken, it should be of a sort intended to cut green wood.

In addition to these, a small tin box full of tools, all of which fit into a single handle, is very valuable; many travellers have found them of the greatest convenience. Unfortunately, they are rather difficult to be met with, as there is now no general demand for them. Those should be taken that are made by one of the best makers; the box that contains them is about six inches long by four broad and one deep; their cost is from 20s. to 30s. Lastly, a saw for metals, a few drills, and small files, may be added with advantage. It is advisable to see that the tools are ground and set before starting.

Tools of too hard steel should not be taken; they splinter against the dense wood of tropical countries, and are very troublesome to sharpen. The remedy is to heat them red hot and to quench in grease to re-temper them. A little iron axe, with a file to sharpen it, and a few awls, are (if nothing else can be taken) a very useful outfit.

A *Lathe* is of universal use; the pulleys necessary for a large sailing boat and the screw for a carpenter's bench cannot

be made without one; and cups and bowls may easily be turned. The sketch will call to mind the original and now



almost forgotten machine, It is obvious that very makeshift contrivances can be set up on this principle, two steady points being the main things wanted. A forked bough will make a treadle, that need not be hinged to the ground in any way.

For turning hollows a long spike is used instead of a short point. Then, a hole is bored into the wood to the depth of the intended hollow, and the spike is made to abut against the bottom of the hole.

§ 2. LASHINGS OF RAW HIDE.—These supersede nails for almost every purpose. It is perfectly marvellous how a gun-stock, for instance, that has been broken into splinters, can be made as strong again as ever, by raw hide sewn round it and left to dry; or instead of sewing it on, the skin of

an ox's leg may be drawn like a stocking over it. It is well to treat your bit of skin as though parchment (p. 144) was to be made of it, burying it and scraping off the hairs before sewing it on. In this way it makes no eyesore. Tendons and any stout fish-skin, such as shagreen, may also be used on the same principle. An axletree, cracked lengthwise, can be mended with raw hide, and a broken tire may be replaced with rhinoceros or other thick hide, if the country to be travelled over be dry.

§ 3. SEASONING AND BENDING GREEN WOOD.—Green wood cannot be employed in carpentry, as, besides being very weak, it warps, cracks, and becomes rotten, and wood dried too quickly loses its toughness as well as pliability. Green wood is thoroughly seasoned by steaming the sap out of it in a boiler and then drying it thoroughly. A makeshift way of doing all this at one simple operation, is to dig a long trench, and make a roaring fire in it; when the ground is burning hot, sweep the ashes away, deluge the trench with boiling water, and in the middle of the clouds of steam that arise, throw in the log of wood, shovel hot earth over it, and leave it to steam and bake. A log thick enough to make an axletree will thus be somewhat seasoned in a single night-time. And there seems no reason why the seasoning should not be perfect, if care was taken in acting up to the theory of the operation. The log would be steamed all the more easily if it were saturated with boiling water before it was put in the trench, and that can always be done by laying it in a deep narrow puddle, and shovelling hot stones into the water. All crowbars, waggon-lifters, &c., should undergo this process at least, as green wood is far too weak for such uses.

The proper way of seasoning is to leave the timber to soak long in water, that the juices may be dissolved out. Fresh

water is better than salt, but a warm mineral spring is excellent for the purpose. Parties travelling with a waggon, ought to fell a little timber on their outward journey, and leave it to season against their return, in case of strained axletrees, broken poles, &c. They might, at all events, cut a ring round through the bark and sap-wood of the tree, and leave it to die, to discharge its juices, and become half seasoned as it stands.

To bend wood or to straighten it if bent, it must be steamed. Either, a rod of green wood may be taken, passed through the ashes of a smouldering fire, and, when hot, bent and shaped with the hand; or, if it be dry, it must first be soaked in a pond or puddle, till thoroughly wet, and then treated in the same way. If the puddle is made to boil by shovelling in hot stones, as described a few lines back, it makes the subsequent operation all the more easy. The long straight spears of savages are often made out of wood that was bent in many ways when cut from the tree, but straightened by them in the ashes of their camp fires. A thick piece of wood must be forcibly bent, as far as can be safely done, tied in position, and steamed as for seasoning, in a trench. After a quarter of an hour, it must be taken out, bent further, and again returned to steam, and so on till it is of the shape required; when bent, it should be left quiet in the trench to season thoroughly. Dry wood can be bent in the same way, and more effectively, but not so quickly as green wood.

§ 4. BARK, TO PROCURE.—Bark is universally used in Australia for roofs of huts and temporary buildings; the colonists learnt the use of it from the natives, and very probably some trees, at least, in every forest country might be found as well fitted for that purpose as those in Australia. The bark admits of being easily removed only when the sap is well up in the tree, but a

skilful person will manage to procure bark at all seasons of the year except in the coldest winter months, and even then he will light on some tree from the sunny side of which he can strip broad pieces. The process of bark stripping is simply to cut two rings right round the tree (usually from 6 to 9 feet apart), and one vertical slit to join them; starting from the slit, and chipping away step by step on either side, the whole cylinder of bark is removed. The larger the tree the better, for if the tree is less than 18 inches, or so, in diameter, the bark is apt to break when flattened out. When stripped for huts, it is laid on the ground for some days to dry, being flattened out on its face, and a few stones or logs put on it. The ordinary bark of gum trees is about $\frac{1}{2}$ inch to $\frac{3}{4}$ ths thick, so that a large sheet is very heavy. Most exploring expeditions are accompanied by a black, whose dexterity in stripping bark for a wet night is invaluable, as, if the bark will "come off" well, he can procure enough of it in an hour's time to make a shelter for a large party.

§ 5. BLACKSMITH'S WORK.—It is of no use attempting to do blacksmith's work if you have not a pair of bellows. These can be made of a single dressed goat-skin, and are sufficient, in skilful hands, to raise small bars of iron to a welding heat. The goat's head is cut off close under the chin, his legs at the knee joint, and a slit is made between the hind legs, through which the carcase is entirely extracted. After dressing the hide, two strongish pieces of wood are sewn along the slit, one at each side, just like the ironwork on each side of the mouth of a carpet bag, and for the same purpose, *i.e.* to strengthen it. Then, after opening these and pulling out the skin, they are suddenly shut, and made to enclose a bag full of air; this, by pushing the skin flat home, is ejected out of the neck, into which a nozzle must be inserted. These

bellows require no valve, and are the simplest that can be made : they are in use throughout India.

The tubes to convey the blast may be made of clay or loam plastered together with grass and moulded round a smooth pole.

Welding composition for iron or steel, is "Borax 10 parts, Sal Ammoniac 1 part; pounded, melted, run out on an iron-plate, and when cold pounded for use."

Fuel.—Dry fuel gives out far more heat than damp or undried. As a comparison of different heating powers, 1 lb. of dry charcoal raises 73 lbs. of water from freezing to boiling; 1 lb. of pit coal, about 60 lbs. ; and 1 lb. of peat, about 30 lbs. Some manure fuel gives intense heat, and is excellent for blacksmiths' purposes, in default of charcoal. That of goats and sheep is the best. Camel's dung is next, but not nearly so good; then that of oxen. Last in the list comes horse's; it is of little use, except as tinder in lighting a fire.

Case-hardening is the name given to a simple process, by which the outside of iron tools can be turned into steel. Small tools, fish-hooks, keys, &c., are usually of iron, case-hardened—finished first, and case-hardened afterwards; because while steel is hard, iron is tough; and anything of iron, coated with steel, combines the advantage of both metals. Take a scrap of leather, hide, hoof, horn, flesh, blood—anything, in fact, that has animal matter in it (even *vegetable* charcoal does)—dry it into hard chips before a fire, and powder it. Then put the iron that has to be case-hardened, with some of this powder round it, into the midst of a lump of loam. This is first placed near the fire to harden, and then quite into it. It should attain to a blood-red heat, and no higher. Lastly, break open the lump, take out the iron, and drop it into water to harden.

Steel.—A mixture of 100 parts of soft iron, and two of lamp soot, melts as easily as ordinary steel—more easily than iron. This is a ready way of making cast-steel where great heat cannot be obtained.

§ 6. TINSMITH'S WORK.—Solder for tin plates is made of one or two parts of tin, and one lead. To solder, the surfaces must be quite bright and close together, and the contact of air must be excluded during the operation, else the heat will tarnish the surface. The borax and resin commonly in use effect this. The point of the soldering tool must be filed bright. A traveller ought certainly to have an hour's practice in soldering before he starts.

Copper, to tin.—Clean the copper well with sandstone; heat it, and rub it with sal ammoniac till it is quite clean and bright. The tin, with some powdered resin, is now placed on the copper, which is made so hot as to melt the tin, and allow it to be spread over the surface with a bit of rag. A very little tin is used in this way. It is said that a piece as big as a pea would tin a large saucepan (20 grains of tin to a square foot of copper).

dry, it must be softened again by damping, not with water in any case, for that makes it dry hard, but with whatever the natives generally employ; thus clotted milk and linseed-meal is used in Abyssinia; cow-dung by the Caffres and bushmen. When a skin is put aside for the night, it must be rolled up, lest it should become dry by the morning. Some grease is usually required by the time that the skin is half-dressed, to make it thoroughly supple.

Smoking skins after they are dressed.—"The greater part of these skins, however, go through still another operation afterwards (besides dressing), which gives them a greater value, and renders them much more serviceable, that is, the process of smoking. For this, a small hole is dug in the ground, and a fire is built in it with rotten wood, which will produce a great quantity of smoke without much blaze, and several small poles of the proper length stuck in the ground around it, and drawn and fastened together at the top (making a cone), around which a skin is wrapped in form of a tent, and generally sewed together at the edges to secure the smoke within it; within this the skins to be smoked are placed, and in this condition the tent will stand a day or two, inclosing the heated smoke; and by some chemical process or other, which I do not understand, the skins thus acquire a quality which enables them, after being ever so many times wet, to dry soft and pliant as they were before, which secret I have never seen practised in my own country, and for the lack of which all our dressed skins, when once wet, are, I think, chiefly ruined." (Catlin.)

§ 2. PARCHMENT AND CATGUT.—The same sort of substance as that which is called parchment when made from sheep or goat-skins, and vellum when from calves, kids, or dead-born lambs, can be made also from any other skin. The raw hide

thrown into vats. These vats contain brine made very strong, being sea-water with great quantities of salt thrown in. This pickles the hides, and in this they lie 48 hours; the use of the sea-water into which they are first put being merely to soften and clean them.

“From these vats they are taken to lie on a platform 24 hours, and are then spread upon the ground and carefully stretched and staked out, so that they may dry smooth. After they were staked, and while yet wet and soft, we used to go upon them with our knives, and carefully cut off all the bad parts: the pieces of meat and fat, which would otherwise corrupt and affect the whole if stowed away in a vessel for months, the large flippers, the ears, and all other parts that prevent close stowage. This was the most difficult part of our duty, as it required much skill to take off everything necessary, and not to cut nor injure the hides. It was also a long process, as six of us had to clean 150, most of which required a great deal to be done to them, as the Spaniards are very careless in skinning their cattle. Then, too, as we cleaned them while they were staked out, we were obliged to kneel down upon them, which always gives beginners the back-ache. The first day I was so slow and awkward that I only cleaned eight; at the end of a few days I doubled my number, and in a fortnight or three weeks could keep up with the others, and clean my proportion, twenty-five.”

Skin dressing.—There is no clever secret in dressing skins; it is hard work that they want—either continual crumpling and stretching out with the hands, or working and trampling about with the feet. A goat-skin takes one person a whole day, an ox-hide takes two persons a day and a half, or even two days' hard labour. It is the simplest plan to begin upon the skin half an hour after it is flayed. If once allowed to

ever so short a piece inside out, just as you would turn up the cuff of a sleeve ; then, catching hold of the edges of the turned-up cuff, dip the whole into a bucket, scoop up a little water between the cuff and the rest of the gut. The weight of this water will do what is wanted ; it will bear down an additional length of previously unturned gut, and thus, by a few successive dippings, the entire length of any amount of intestine, however narrow it may be, can be turned inside out in a minute or two.

Having turned the intestine inside out, scrape off the whole of its inner soft parts ; what remains is a fine transparent tube, which, being twisted up tightly and stretched to dry, forms catgut.

§ 3. HORN, GLUE, AND ISINGLASS.—Horn is so easily worked into shape, that travellers, especially in pastoral countries, ought not to be in ignorance of its properties. By boiling, or exposing to heat in hot sand, horn is made quite soft ; it can be moulded in what shape you will, and when cold it will keep it. Not only this, but it can be welded by heating and pressing two edges together, which, however, must be clean and quite free from grease—even the touch of the hand taints them. Sheets of horn are a well-known substitute for glass. Ox-horn is left to soak for a fortnight in a pond, then well washed, to separate the pith, and boiled again for half an hour. After this, it is sawn lengthwise and boiled continually till it is ready to split into sheets ; this is done with a chisel. The sheets are again boiled, scraped of a uniform thickness, and set in shape to dry. Tortoiseshell and whalebone can be softened and worked in the same way.

Glue is made by boiling down hides, or even tendons, hoofs, horns, &c., for a long time, taking care they are not charred, drawing off the fluid, and letting it set.

Isinglass is made readily by steeping in cold water, and then gently boiling into a jelly, the stomach and intestines of fish. This is spread into sheets and allowed to dry. The air-bladders of sturgeons make the true isinglass.

VARIOUS.

§ 1. Candles, Wax, &c.

§ 2. Soap, and its substitutes.

§ 3. Pottery.

§ 4. Charcoal, Tar, &c.

§ 1. Candles, WAX, ETC.—It is usual, when on an expedition, to take tin moulds and a ball of wick, for making candles, from time to time when fat can be obtained. The most convenient mould is of this shape. It is unnecessary to explain how to



use it, save that after the tallow has been poured in, the mould should be dipped in cold water. Mutton suet mixed with ox-tallow makes the best candles of all. Tallow should never be melted over a hot fire; it is best to melt it by putting the pot in hot sand. Candles that are dipped gutter and run much more than mould candles, if they have to be used as soon as made. The way of dipping them is to tie a number of wicks to the end of a wooden handle, so shaped that the whole affair looks much like a garden-rake, the wicks being represented by the teeth of the rake; then the wicks are dipped in the tallow, and each is rubbed and messed by the hand till it stands stiff and straight; after this, they are dipped altogether, several times in succession, allowing the fresh coat of tallow to dry before another dipping. A strip of cotton drenched in grease, and wound spirally round a wand, will burn for half an hour.

Candlestick.—A hole cut with the knife in a sod of turf, or a potatoe; a nail hammered right through a piece of wood, the candle being stuck on its point; a hollow bone; an empty bottle; and a bayonet stuck in the ground, are all used as makeshift candlesticks. "In bygone days, the broad feet, or

rather legs, of the swan, after being stretched and dried, were converted into candlesticks." (Lloyd.)

Wax.—Boil the comb for hours, till it is thoroughly melted, together with a little water to keep it from burning; then press the melted mass, through a cloth, into a deep puddle of cold water. This makes bee's-wax. A lump of bee's-wax, with a tatter of an old handkerchief run through it, makes a candle on an emergency. To find way, *see* p. 68.

Lantern.—A wooden box, a native bucket, or a calabash, will make the frame, and a piece of greased calico stretched across a hole in its side will take the place of glass (*see Horn*, p. 146).

§ 2. SOAP, AND ITS SUBSTITUTES.—The lye of ashes and the gall of animals are the readiest substitutes for soap. The sailor's receipt is well known, but it is too dirty to mention. Bran, and the meal of many seeds, is good for scouring, and also some earths, like fuller's earth. Therefore, if you want a good day's washing, boil an abundance of ashes in water, strain off the lye, adding the gall of any animal you may have killed, and let the clothes soak in it. Next morning, take them to the water-side, and wash and beat them with a flat piece of wood, or lay them on one broad stone and beat them with another.

In choosing plants to burn for ashes, as above, for the sake of the potash they contain, it must be recollected that stalks of succulent plants, as reeds, maize, broom, heath, furze, and such like, are very far better than those of any trees; and that twigs are better than timber. Pine and fir trees are the worst of all.

10,000 parts of pine or fir . . .	contains	4 parts of potash.
„ poplar . . .	„	7 „
„ beechwood . . .	„	14 „

10,000-parts of oak	contains	15 parts of potash.
„ willow	„	28 „
„ elm, maple, and wheat- straw	„	39 „
„ thistles, flax-stems, and small rushes	„	50 „
„ large rushes	„	72 „
„ stalk of maize	„	175 „
„ bean-stalks	„	200 „

Soap is fat kept constantly simmering in lye of ashes for some days, adding fresh lye as the water boils away, or is sucked up by the fat. After one or two trials, the knack of soap-making is easily caught. The presence of salt makes the soap hard; its absence, soft. Many ashes contain a good deal of salt, and these may make the soap too hard, and will have to be mixed with other sorts before being used. Experience must teach this. Any native woman will attend night and day to the pot-boiling for a small payment.

Inferior soap may be made by simply putting some grease into a tub of *strong* lye, and letting it remain for two or three weeks, without any boiling, but stirring it once every day.

Marine soap is made of soda-lye, and cocoa-nut oil; it makes a lather with salt water, but is very bulky.

§ 3. POTTERY.—Most savages have pottery, but few know how to glaze it. One way, and that which was the earliest known, of doing this, is to throw handfuls of salt upon the jar when red hot in the kiln.

§ 4. CHARCOAL, TAR, ETC.—Charcoal is made in the simplest way by digging a hole in the earth, or choosing some old well or gigantic burrow, and filling it with piles of wood, arranging them so as to leave a kind of chimney down the centre. The top of the well is now covered over, excepting the chimney, down which a brand is dropped to set fire to

the wood. The burning should proceed very gradually, and be governed by opening or shutting the chimney-top with a flat stone; for the wood should smoulder, and never attain to a bright red; it will take from two days to a week to make charcoal. The tarry products of the wood drain to the bottom of the well.

Tar is made by burning larch, fir, or pine, as though charcoal had to be made; dead or withered trees, and especially their roots, yield tar most copiously. A vast deal is easily obtained. It collects at the bottom of the pit, and a hole should be cleanly dug there into which it may drain.

Pitch is tar boiled down. Turpentine is the juice that the living pine, fir, or larch tree secretes, in blisters under the bark, which are tapped to obtain it. Resin is turpentine boiled down.

WRITING MATERIALS.

§ 1. Paper.

§ 2. Book-binding.

§ 3. Quills, Brushes, Pencils.

§ 4. Ink, Lampblack, Ox-gall.

§ 5. Wafers, Signets.

§ 1. PAPER.—The coarsest foreign paper can be sized, so as to prevent its blotting when written on, by simply dipping it in, or brushing it well over with, milk and water, and letting it dry. A tenth part of milk is amply sufficient. Messrs. Huc and Gabet inform us that that is the regular process of sizing, as used by paper-makers in Thibet.

Metallic-paper is made by rubbing a paste of a little weak glue, with bones burnt to whiteness and pounded, on the surface of the paper.

Tracing-paper.—The transparent kind can hardly be made by a traveller; but he may prick out the leading points of his map or other design, and then, laying it on a sheet of clean paper, charcoal, &c., can be rubbed through. Black tracing-paper is made by rubbing a mixture of soap, lamp-black, and a little water, on the paper, and when dry wiping off as much as possible with a cloth.

Travellers' unbound books become so terribly dilapidated, that I think it well to give a detailed description of book-binding, of which I have found a very clear one in the "Penny Magazine."

§ 2. BOOK-BINDING.—"The sheets are first beaten or pressed, then three or more strings are stretched perpendicularly to a table; against these the sheets of the book are succes-

sively laid, and to them they are sewn. Usually, a saw-mark is made for the reception of each, by first fixing the whole group of sheets in a press or vice, and making shallow cuts with a saw across their backs. They are sewn by a threaded needle being passed backwards and forwards through the central fold of the sheet, and each thread, after passing from the inside to the out, being made to loop or twist round one of the strings before entering the sheet again. As soon as one sheet is fastened to all the strings, another is laid down upon it, and fastened in a similar way. When all the sheets are sewn, an inch or two of each string is left hanging to it. The back of the whole is then glued over as a further security. Next, by hammering, the back of the book is made to look rounded; but this process is not essential. Then it is placed between two pieces of plank, called 'backing-boards,' the hinder edges of which are precisely where the two hinges of the book are to come. The book, with the boards thus placed, is then squeezed tightly in a press, with the back edge uppermost; and the back being again hammered in a round form, a portion of edge projects over the boards, so as to form a kind of groove, into which the millboard that forms the stiff sides may afterwards be conveniently adjusted. The edges are then cut."

§ 3. QUILLS, BRUSHES, PENCILS.—*Quills for writing.*—Any feather that is large enough, can be at once made into a good writing-quill. It has only to be dipped in hot sand, which makes the membrane inside the quill shrivel up, and the outside membrane split and peel off. A few instants is sufficient to do this. The operation may be repeated with advantage two or three times. The proper temperature of the sand is about 140°.

Paint brushes.—Wash the bit of tail or skin, whence the

hair is to be taken, in ox-gall till quite free from grease. Then snip the hairs off close to the skin, put them points upwards resting in a box, and pick out the long hairs. When a quantity are obtained of precisely the same length, a piece of string is knotted tightly round them, and pulled as firm as possible, with the aid of two sticks. A quill, that has been soaked for a day in water to soften it, is then taken, and the pinch of hair is put into the large end of the quill, points forward, and pushed right through to the other end with a bit of stick; and so the brush is made. Several can be made at the same time with little more trouble than one.

Pencils.—Saw charcoal into narrow strips and lay them in melted wax to drench for a couple of days; they are then ready for use, as a makeshift.

§ 4. INK, LAMPBLACK, OX-GALL.—An excellent writing-ink may be made most readily in the bush. The simplest way, and one which is also clean, is to blacken sticks in the fire and rub them well in a spoonful of milk, till the milk has been made quite black. Gunpowder or lamp-soot will do as well as the burnt stick; and water, with a very little gum, glue, or fish-glue (isinglass) is cleaner than the milk, and will not so soon turn sour. Indian ink is stated to be simply lamp-soot and glue, and it is one of the best of inks. If water only be used, instead of gum or glue and water, the writing will rub out very easily as soon as it becomes dry: the use of the milk, gum, or glue, being to *fix* it. Anything glutinous will do as well as these. Strong coffee and many other vegetable products, as the bark of trees boiled in water, makes a very legible mark, which stains the paper and will not rub.

Lampblack.—Hold a piece of tin, or anything, over a flaring wick in a cup of oil, and plenty of soot will collect.

Ink.—To make 12 gallons of good common writing-ink, use 12 lbs. of nut-galls, 5 lbs. of green sulphate of iron, 5 lbs. of gum, 12 gallons of water. (Ure.)

Sympathetic ink.—Nothing is better or handier than milk. The writing is invisible until the paper is almost toasted in the fire, when it turns a rich brown. The juice of lemons and many other fruits will also do.

To make ink or paint take upon greasy paper, a very little ox-gall should be mixed with it. It is very important to know this simple remedy, and I therefore extract the following information from Ure's Dictionary.

Gall of animals, or ox-gall, to purify.—"Take it from the newly-killed animal, let it settle for 12 or 15 hours in a basin, pour the liquid off the sediment into an earthenware pot, and set the pot into a pan of water kept boiling, until the gall liquid becomes somewhat thick. Then spread it on a dish, and place it before the fire till nearly dry. In this state it may be kept, without any looking after, for years. When wanted, a piece the size of a pea should be dissolved in water. Ox-gall removes all grease spots from clothes, &c."

§ 5. WAFERS, SIGNETS.—Wafers are made of flour and water suddenly baked hard. From a sheet prepared in this way, the wafers are punched out. Gum wafers are made by pouring thick gum and water on a slightly-greased surface (a looking-glass, for example), and another greased glass is put on the top of the gum, to make it dry even. Out of this, when dry, the wafers are punched.

Signets.—Allusion has been made to the fact that many excellent and worthy bushmen have the misfortune of not knowing how to write. Should any such be placed in a post of confidence by an explorer, there might be great use in his cutting himself a signet out of soft stone, such as the Europeans of by-

gone generations, and the Turks of the last one, very generally employed. The name or device is cut on the seal, and before using it, the paper is moistened with a wet finger, and ink is dabbed over the ring with another. The impression is then made just as in sealing a letter.

In setting a man to keep count who cannot reckon, give him a string of beads. The boxes and parcels that travel by the overland route are, or were, counted in this way by an Arab overseer. He was described as having a cord with great beads strung on it, and the end of the cord was thrown over his shoulder. As each box passed him, he jerked a bead from the fore part of the cord to the back part of it, over his shoulder.

CATTLE.

§ 1. Merits of different Beasts.

§ 2. Kraals and Cattle Bells.

§ 3. Facts about Mules.

§ 4. Milking wild Cows.

§ 5. Horse-breaking and Charming.

§ 6. Breaking in Oxen.

§ 7. Vice and Temper.

§ 8. Et Cetera.

Happy is the traveller who has the opportunity of hiring his cattle with their attendants; for his delays and cares are then reduced to those of making a bargain, and of riding what he has hired, and when one set of animals are tired or worn out, he can leave them behind and ride on with others. But, for the most part, explorers must drive their own beasts with them; they must see to their being watered, tended, and run after when astray; help to pack and harness them; fatigue themselves for their benefit; and drudge at the work of a cowherd for, it may be, some hours a day.

In fitting out a caravan, as few different kinds of animals should be taken as possible, or they will split into separate herds, and require many men to look after them. Mules and camels must never be taken together—they have a mutual aversion, which time will seldom, if ever, overcome.

§ 1. MERITS OF DIFFERENT BEASTS.—The ass is an excellent and sober little beast, far too much despised by us. He is not only the most enduring, but one of the quickest walkers among cattle, being usually promoted to the leadership of a caravan. He is nearly equal to the camel in enduring thirst, and thrives on the poorest pasture, suffers from few diseases, and is unscathed by African distemper. The long desert

roads and pilgrim-tracks* of North Africa are mostly travelled over by means of asses.

Mules require men who know their habits; they are powerful beasts, and can only be mastered with skill and address. A savage usually fears their heels, and will not assist in packing them. They have odd secret ways, strange fancies, and lurking vice. When they stray, they go immense distances, and it is almost beyond the power of a man on foot to tend them in a wild country. He can neither overtake them easily, nor, when overtaken, catch them. The female is in most breeds much the most docile. They suffer from African distemper, but in a less degree than horses.

Oxen, though they are coarse, gross, and phlegmatic beasts, have these merits—they are eminently gregarious animals, and they ruminate their food. The consequence is, first, that one, two, or more are very seldom missing out of a drove; and secondly, that they pick up what they require in a much shorter time than horses, mules, &c., who have to chew as they eat. In fact, oxen require less tending than any other beasts of burden.

Brands and cattle marks.—In buying oxen out of the herds of pastoral people, it is very difficult to remember each animal so as to recognise it again if it strays back to its former home; indeed it requires quite a peculiar talent to do so. All cattle should be marked or branded. A trader in Namaqua Land took red paint, and tied a brush on to a long stick; with this he made a daub on the hind quarters of the freshly-bought and half-wild cattle as they pushed through the door of his kraal. It naturally excites great ridicule among natives to paint an ox that he may be known again; but for all that, I think the trader's plan well worth adopting. The same might be done to sheep, as a slit ear is

not half conspicuous enough; a good way of marking a sheep's ear is to cut a wad out of the middle of it with a gun punch; but it will sometimes tear this hole into a slit, by scratching with its foot.

Camels are only fit for a few countries, and require practised attendants; thorns and rocks lame them, hills sadly impede them, and a wet slippery soil entirely stops them.

The disposition of the animals that compose a caravan affect, in no small degree, the pleasure of travelling with it; now it is to be noticed that men attach themselves to horses and asses, and in a lesser degree to mules and oxen, but camels are never made friends of.

The net weights that these different animals carry for long-continued journeys, through stages uncertain in length, sometimes leading to good pasture, sometimes to bad, must not be reckoned on at higher than the following; and an animal draws about $2\frac{1}{2}$ times as much net weight as he carries:—An ass, 65 lbs.; a small mule, 90 lbs.; a horse, 100 lbs.; an ox, 120 lbs. A small dead weight, strapped as it is with tight girths on an animal's back, fatigues him far more than a rider, who keeps his own balance.

Dogs, for Arctic travel, are used in journeys after they are three years old; each dog requires eight or ten herrings per day, or an equivalent to them. A sledge of 12 dogs carries 900 lbs; it travels on smooth ice seven or eight miles an hour; and in 36 days, 22 sledges and 240 dogs travelled 800 miles (1210 wersts). (Admiral Wrangel.)

Sheep-dogs seem to prove of less use to travellers than might have been expected; perhaps the other dogs corrupt them.

Goats are much more troublesome to drive than sheep, neither are they such enduring walkers, nor give as much

meat; but their skins are of such great use as leather that it is seldom convenient to make up a caravan without them. She-goats give some milk, even when travelling fast; but a ewe sheep is not worth milking, as her yield is a mere nothing. Goats are very mischievous—they make their way out of all enclosures, and trespass everywhere. They butt at whatever is bright or new, or strange to them; and would drive an observer, who employed astronomical instruments on stands, to distraction.

§ 2. KRAALS AND CATTLE BELLS.—In an open country, where there are no bushes for a kraal, nets must be taken, and stakes cut, to make enclosures for the sheep. If they stray at all, the least thing scares them, and they wander very far, and scatter. Goats are far more social and intelligent. If one, two, or three sheep only be driven, long thongs must be tied to their legs, and allowed to trail along the ground, by which they may be re-caught if they gallop off.

Cattle bells, in countries where they can be used without danger, should always be taken; it adds greatly to the cheerfulness and the gregariousness of the animals—mules positively require them. Hard wood is sonorous enough for bells.

§ 3. FACTS ABOUT MULES.—“The *madrina* (or godmother) is a most important personage. She is an old steady mare, with a little bell round her neck, and wheresoever she goes, the mules, like good children, follow her. If several large troops are turned into one field to graze in the morning, the muleteer has only to lead the *madrinas* a little apart, and tinkle their bells, and although there may be 200 or 300 mules together, each immediately knows its own bell, and separates itself from the rest. The affection of these animals for their *madrina* saves infinite trouble. It is nearly impossible to lose an old mule; for if detained several hours by force, she will, by

the power of smell, like a dog, track out her companions, or rather the *madrina*; for, according to the muleteer, she is the chief object of affection. The feeling, however, is not of an individual nature; for I believe I am right in saying that any animal with a bell will serve as a *madrina*." (Charles Darwin.)

"After travelling about 14 miles, we were joined by three miners; and our mules taking a sudden liking for their horses, jogged on at a more brisk rate. The instincts of the mulish heart form an interesting study to the traveller in the mountains. I would (were the comparison not too ungallant) liken it to a woman's, for it is quite as uncertain in its sympathies, bestowing its affections when least expected, and when bestowed quite as constant, so long as the object is not taken away. Sometimes a horse, sometimes an ass, captivates the fancy of a whole drove of mules, but often an animal nowise akin. Lieutenant Beale told me that his whole train of mules once galloped off suddenly, on the plains of the Cimarrone, and ran half a mile, when they halted, in apparent satisfaction. The cause of their freak was found to be a buffalo-calf, which had strayed from the herd. They were frisking around it in the greatest delight, rubbing their noses against it, throwing up their heels, and making themselves ridiculous by abortive attempts to neigh and bray, while the poor calf, unconscious of its attractive qualities, stood trembling in their midst. It is customary to have a horse in the mule-trains of the traders of Northern Mexico, as a sort of magnet to keep together the separate atoms of the train, for, whatever the temptation, they will never stray from him." (Taylor's "Eldorado.")

§ 4. MILKING WILD COWS.—Many breeds of cows cease to give milk after their calf dies; and the only way of making them continue their yield is to spread out the calf's hide for them to

lick some time before milking them ; it retains its effect for a week or more. Messrs. Huc and Gabet give the following graphic account of this contrivance, as applied to restive cows : —“ These long-tailed cows are so restive and difficult to milk, that, to keep them at all quiet, the herdsman has to give them a calf to lick meanwhile. But for this device, not a single drop of milk could be obtained from them. One day a Lama herdsman, who lived in the same house with ourselves, came, with a long dismal face, to announce that his cow had calved during the night, and that unfortunately the calf was dying. It died in the course of the day. The Lama forthwith skinned the poor beast, and stuffed it with hay. This proceeding surprised us at first, for the Lama had by no means the air of a man likely to give himself the luxury of a cabinet of natural history. When the operation was completed, we observed that the hay-calf had neither feet nor head ; whereupon it occurred to us that after all it was perhaps a pillow that the Lama contemplated. We were in error, but the error was not dissipated till the next morning, when our herdsman went to milk his cow. Seeing him issue forth, the pail in one hand, the hay-calf under the other arm, the fancy occurred to us to follow him. His first proceeding was to put the hay-calf down before the cow. He then turned to milk the cow herself. The mamma at first opened enormous eyes at her beloved infant ; by degrees she stooped her head towards it, then smelt at it, sneezed three or four times, and at last proceeded to lick it with the most delightful tenderness. This spectacle grated against our sensibilities ; it seemed to us that he who first invented this parody upon one of the most touching incidents in nature must have been a man without a heart. A somewhat burlesque circumstance occurred one day to modify the

indignation with which this treachery inspired us. By dint of caressing and licking her little calf, the tender parent one fine morning unripped it; the hay issued from within, and the cow, manifesting not the slightest surprise nor agitation, proceeded tranquilly to devour the unexpected provender."

The Highlanders used this contrivance, and called it a "Tulchan;" hence King James's bishops were nicknamed "Tulchan bishops," to imply that they were officials of straw, merely set up as a means of milking the Scotch people of their money in the form of church-dues.

§ 5. HORSE-BREAKING AND CHARMING.—"The actual mode of taking wild-horses is by throwing the lasso, whilst pursuing them at full speed, and dropping a noose over their necks, by which their speed is soon checked, and they are choked down.

"The lasso is a thong of raw hide, some 10 or 15 yards in length, twisted or braided, with a noose fixed at the end of it, which, when the coil of the lasso is thrown out, drops with great certainty over the neck of the animal, which is soon conquered.

"The Indian, when he starts for a wild-horse, mounts one of the fleetest he can get, and coiling his lasso on his arm, starts off under full whip, till he can enter the band, when he soon gets it over the neck of one of the number. He then instantly dismounts, leaving his own horse, and runs as fast as he can, letting the lasso pass out gradually and carefully through his hands, till the horse falls for want of breath, and lies helpless on the ground. The Indian now advances slowly towards the horse's head, keeping the lasso tight upon its neck, until he fastens a pair of hobbles on the animal's fore-feet, and also loosens the lasso (giving the horse chance to breathe), and gives it a noose round the lower jaw. By this he gets great

power over the affrighted animal, which is rearing and plunging when it gets breath, and by it, as he advances, hand over hand, towards the animal's nose, he is able to hold it down, and prevent it from throwing itself over on its back at the hazard of its limbs. By this means he gradually advances, until he is able to place his hand on the animal's nose and over its eyes, and at length to breathe, not blow, in its nostrils, when it soon becomes docile and conquered, so that he has little else to do than to remove the hobbles from its feet, and lead or ride it into camp. This breaking down, or taming, however, is not without the most desperate struggle on the part of the horse, which rears and plunges in every possible way to effect its escape, and it becomes covered with foam, but at last yields to the power of man, and becomes his willing slave for life. By this very rigid treatment, the poor animal seems to be so completely conquered that it makes no further effort for its freedom, but submits quietly ever after, and is led or ridden away with very little difficulty. Great care is taken, however, in this and in subsequent treatment, not to subdue the spirit of the animal, which is carefully preserved and kept up, although they treat them with great severity, being, generally speaking, cruel masters." (Catlin's "North America.")

In breaking in a stubborn beast, it is convenient to physic him until he is sick and out of spirits, or to starve him into submission.

Shooting horse.—Spur him as you will, but never use a whip; else whenever you raise your gun to fire, he will feel a dread that it may be the whip, and is sure to be a little unsteady.

In climbing a steep hill, hang on to the tail of your horse as you walk behind him. Horses are easily driven in file by securing the halter of each horse to the tail of the one before him.

§ 6. BREAKING IN OXEN.—An ox of any age, however wild he may be, can be broken in, in three or four days, so as to carry a pack of about 70 lbs., though it is true that he will frequently kick it off by the way, and give excessive trouble. It would be scarcely possible to drive more than three of these newly-taught oxen at a time, on account of the frequent delays caused by the unruliness of one or other of them. Much depends on the natural aptitude of the animal in estimating the time required for making a steady pack-ox; some will carry a good weight and go steadily after only a fortnight's travel; some will never learn. But in all cases they prove unruly at the beginning of a journey.

It takes a very long time to train an ox to carry a riding-saddle well and steadily; indeed, very few oxen can be taught to go wherever they may be guided by the rider; they are of so gregarious a nature, that, for the most part, they will not move a step without companions. Hence, those oxen only are thought worth breaking in who are observed to take the part of leaders of the drove when pasturing, and who are therefore supposed to have some independence of disposition.

To break in an ox, take a long thong or cord, make a noose at one end of it, and let two or three men lay hold of the other; then driving all the herd together in a clump, go in among them, and aided by a long stick, push or slip the noose round the hind leg of the ox that you want, and draw tight. He will pull and struggle with all his might, and the other oxen will disperse, leaving him alone dragging the men about after him. Next, let another man throw a noose round his horns, and the beast is, comparatively speaking, secured. It is now convenient to throw the animal down on his side, which is easily done by judicious tugging at his tail and at the thongs. To keep him on the ground, let one man take the tail, and

passing it round one thigh, hold him down by that, while one or two men force the horns down against the ground. His nose has next to be pierced. A stick, shaped like a Y, 8 inches long, is cut of some tough wood; and the foot of it, being first sharpened, is forcibly poked through the wall that divides the nostrils, and a thin thong is tied firmly to either end of this nose-stick.

The thong is gathered together, and wound in a figure of 8 round the two horns, where it henceforward remains while the animal feeds, and by clutching at which, he is at any time caught. Next for the packing: as the ox lies on the ground, scrape a hole in the sand under his belly, and then having laid a few skins on his back, pass a thong round and round him and them several times; tie the ends fast, and taking a stick, pass it through and twist it round, until the lashings are extremely tight, when it is secured. Now let the ox go, and get quickly out of his way, in case he should be savage. When the ox gets up, he is sulky and ferocious by turns, and kicks, jumps, and bellows, but at last joins his companions.

If he has been well packed, the skins will keep in place and not fall off; but whether they do or not, he must be re-caught and re-packed every day. A young ox is generally more difficult to break in than an old one, I do not know why. An ox requires no pack-saddle; his back is too round to carry one with advantage. It is therefore usual to lay what spare skins, &c., are at hand upon him, and over these the bags that have to be packed. A great length of thong is required to lash them. It is convenient to make a pair of very large saddle-bags out of skin or canvas, which require simply to be placed on the ox's back and there girthed.

To train an ox to carry a rider.—The first time of mounting an ox to break him in is a work of almost certain mischance,

for the long horns of the ox will often reach the rider, however far back he may sit, and the animal kicks and bucks in a way that severely tries the best of seats. All riding oxen's horns should have the tips sawn off. After being mounted a very few times, the ox goes pretty steadily, but it is long before he learns to carry a rider with ease to himself.

In riding, it must be recollected that the temper of an ox is far less quick, though his sensations may be as acute, as those of a horse; thus, he does not start forwards on receiving a cut with the whip, even though he shrink with the pain, but he thinks about it, shakes his head, waits a while, and then breaks gradually into a faster pace. An ox will trot well enough with a light weight, and though riding myself upwards of 13 stone, I once took an ox 60 miles in a day and a half; this is, perhaps, as much as an ox could in fairness be made to do. An ox can be tied up by his nose bridle, but if wild or frightened he will assuredly struggle till the nose stick be torn out of his nose, and he is free. It is, therefore, better to tie the bridle to a tuft of grass, or a slender twig, rather than to a tree or to the saddlebags. Mounting an ox is usually a troublesome business, on account of his horns. To make oxen quiet and tame, scratch their back and tails—they dearly love it—and hold salt in your hands for them to lick. They soon learn their names, and come to be caressed when called.

§ 7. VICE AND TEMPER.—To make an animal rise when he throws himself on the ground with his pack, and will not get up, it is not much use to flog him; twisting or biting his tail is the usual way, or making a blaze with grass and a few sticks under his nostril. The stubbornness of a half-broken ox is sometimes beyond conception.

A jibbing horse yields often to the East Indian plan, when the cruellest whipping has no effect. It is to pass a string

round his foreleg, and watching a good opportunity, to pull it gently and coaxingly forwards; he usually yields to the suggestion and moves onwards.

Asses taught not to kick.—Mungo Park says that the negroes where he travelled taught their asses as follows:—They “cut a forked stick, and put the forked part into the ass’s mouth, like the bit of a bridle; they then tied the two smaller parts together above his head, leaving the lower part of sufficient length to strike against the ground, if the ass should attempt to put his head down. It always proved effectual.”

§ 8. ET CETERA.—To cut chaff, tie a sickle against a tree with its blade projecting; then standing in front of the blade, hold a handful of straw across it with both hands, one hand on either



side of the blade; pull it towards you, and the straw will be cut through; drop the cut end, seize the straw afresh, and repeat the process. In this way, after a little practice, chaff is cut with great ease and quickness. A broken sickle does as well as a whole one, and a knife may be used, but the curve of its edge is ill adapted for the work.

Pulling cattle out of holes.—The bight of a cord may be thrown over a horse's head, and he can be dragged out by a team of cattle with but very little danger to his neck. A crupper under his tail, or a thong as a breeching, may be used.

SADDLES, BRIDLES, AND PACKING GEAR.

§ 1. Saddles.

§ 2. Saddle-bags.

§ 3. Girths, Stirrups, Bridles, &c.

§ 4. Pack-saddles.

§ 5. Tethers, Hobbles, and Knee-halters.

§ 1. SADDLES.—Sore backs are the plague of beasts of burden, for if the skin be once broken it will never heal thoroughly again during the whole journey. Every precaution should, therefore, be taken at first starting, such as well-stuffed saddles, ample saddle-cloths, without hem or edging (blankets are as good as any), short journeys, light and carefully-balanced packs, frequent rests of a day or two, and salt-water rubbed in. It is observed that travelling in the very early morning is bad for animals' backs, but that travelling late at night is not so.

The first appearance of a sore back is a small hardish swelling or *warble*: this must at once be attended to by folding the saddle-cloth in some appropriate way, or even by picking out the saddle stuffing, so as to ease all pressure from off it, otherwise it will get larger and larger, and a single day will convert what might have been easily cured into a serious and irremediable gall.

Good saddles for riding, and especially for packing, are of nearly as great importance as the goodness of the animal who carries them. English saddlers never, I believe, can be induced to stuff a saddle sufficiently, because they have no opportunity of seeing the miserable, scraggy condition of a

travelled horse's back, to which they are destined to fit. But an English saddle, re-stuffed at a bush frontier town, is excellent.

Three rings, and nine of what saddlers call "D's," should be fixed to the saddle, not simply into the leather-work, but firmly riveted or secured into the tree itself. This must be especially insisted on, or frequent disasters will happen. The three rings are fixed on to the pommel, one on its top, and one on each side of it; the nine "D's" are placed as follows:—three along the back of the saddle, two more on each side of the seat, and two in front, for the breast-plate.

To these are tied a light valise in front; a gun holster on the right of the pommel; and a small bag, containing odds and ends, gunpowder, spare bullets, a few presents, &c., on the left. On the right of the seat, a sabretasch, or thin leather portfolio-shaped pocket, for paper and writing materials; on the left, the water canteen and hobbles; behind, the crupper and small saddle-bags. The breast-plate is not worth using, except in a very hilly country. This description, of course, applies to the saddle of the horse ridden as a travelling horse. For shooting purposes, the matter is different; and only the gun holster, and perhaps the canteen, are taken. An ox carries a saddle precisely like a horse. I rode mine nearly 1600 miles, in South Africa, with a common hunting saddle and its ordinary girths.

§ 2. SADDLE-BAGS are such troublesome things to open, and require so many straps, that I believe it is best to use simply a bag of mackintosh, or canvas, rolled up and tied behind the saddle, resting on a pad. The pad is made of two cushions, each 9 inches long, and 4 broad, sewn parallel to one another, and 4 inches apart, on to a piece of leather.

The space between the cushions corresponds to the backbone of the horse. To the upper surface of the pad, which is that on which the bag rests, it is usual to stitch four or five laths of wood, running lengthwise, to keep the whole in shape. If there be occasion to carry a bag on horseback for a short distance, pass one of the stirrup-leathers through its string and pull it home; then throw the bag over to the other side of the saddle; it will lie behind the rider's leg, and out of his way, and he will sit upon part of its string.

§ 3. GIRTHS, STIRRUPS, BRIDLES, ETC.—A roll of spare webbing, to patch up torn girths, should be taken; but a good substitute for a girth is made by taking a band of tanned, or even of dressed, leather, cutting it, to within four inches of the end, into seven or nine bands, and plaiting these together.

It takes a beginner just ten times as long to plait a girth as to weave it, and for making more than one girth it is well worth while to make a rude loom. Do this as follows: make a little ladder with as many "rounds" to it as you intend to use threads; the rounds must be pretty close together, just allowing room for the threads numbered 1, 3, 5, 7, &c., to pass between them, and must be 8 or 9 inches long; the rounds must have holes bored through their middles for the threads numbered 2, 4, 6, &c., to pass through. By alternately lifting and depressing this ladder with the hand, the action of the loom is produced. The weft is a long thong or string wound on a fishing-net needle, or something equivalent to it, and each time after passing it, the thread just passed is beat home with a flat rod like a ruler. After two or three experiments, one becomes quite a proficient at rude weaving.

Stirrups must be very roomy, enough to admit clumsily-shaped shoes, such as are made in the bush; they must be broad under the sole of the foot, and also at the place which

rub against the little toe. Substitutes for stirrups are easily cut out from any thick raw hide—that of giraffe, rhinoceros, or sea-cow does admirably.

In default of riding-saddles, a pack-saddle must be taken and cushioned (see *Pack-saddles*).

Bridles and bits.—Leave behind all English notions of snaffles and double reins, and ride with nothing but an easy curb. The horse must also carry a headstall and a halter, and I like one with plenty of tassels to keep off the flies. A temporary substitute for a curb is made by noosing a string, and putting the noose round the horse's lower jaw. If the string be long enough, it can be doubled back again, and tied to the other side of the noose, so as to make a complete bridle. The groom's fashion of giving the halter a hitch, and putting it round the jaw, is well known.

Buckles, padlocks, rings.—If the tongue of a buckle breaks, a nail or a peg, pushed through the buckle-hole, will, as in the figure, replace it.

A padlock, locked through the next buckle-hole, prevents pilferers from unbuckling and opening the package. It is well to learn some artful sailor's-knot for tying up bags, which other people cannot meddle with without your finding it out.

A contrivance like this will often be found useful to replace a buckle and strap; by twisting up the lower thong more

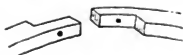


tightly, its length can be shortened as much as may be required.

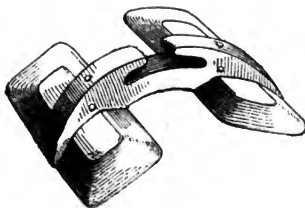


In packing-gear and other harness, use is frequently made of rings. Iron ones may be replaced by a loop of tough wood, such as the peasants of the Campagna always employ; a piece of the thickness of a small walking-stick, and eight inches long, is taken and bent; its arms are notched where they cross, and there nailed or lashed.

§ 4. PACK-SADDLES.—Cut four bent pieces of tough wood, and two small planks, season them as well as you can, and join them together, as in the drawing, using raw hide in addition



to nails or pegs. Stuffed cushions must be tied, or otherwise secured, inside the planks. With a saw and a mortice-chisel the following one would be very easy to make. The art of good packing is to balance the packs accurately, and to lash



them very tightly to the saddle. The entire load is then secured to the animal's back by moderate girthing. It is going on a false principle to wind one long cord round the horse, saddle, and packs, making, as it were, a great faggot of them.

To tighten the lashings of a pack, thrust a stick through them, and twist it forcibly round and round till the lashings are screwed tight enough, and then secure the stick.

Half-filled sacks often require to have laths of wood, or a handful of twigs, put between them and the packing-cord, to equalise its pressure ; otherwise, they are strangled out of shape and never lie firm.

Cruppers for pack-saddles, in very mountainous countries, can readily be made on the spot, like those in use in Norway ; where, instead of a ring encircling the tail and fretting its sides, a short bar of wood, a foot long, is passed under it, and from either end of the bar a cord is tied to the pack-saddle.

§ 5. TETHERS, HOBBLES, AND KNEE-HALTERS.—Cattle may be secured at night by being tethered, hobbled, knee-haltered, or driven into an inclosure made of bushes. The nature of the country, and what dangers are apprehended, determine which plan is most advisable. A knee-haltered horse has a good chance of escape if he scents a wild beast that is creeping up to him ; for he can gallop, though with labour, to a short distance. A hobbled horse has no chance at all, though, indeed, they have been known to fight desperately with their teeth and feet, and learn to be cunning and watchful. If the hobbles are of iron, and made like handcuffs, it is hardly possible for robbers, at all events for savages, to unlock or cut them. A horse that is hobbled

or knee-haltered can graze during the night ; but if tied up or pounded, his grass must be cut for him. A horse may be successfully hobbled with a stirrup-leather, by putting its middle round one fetlock, then twisting it half a dozen times, and, lastly, buckling it round the other fetlock. Oxen are often picketted to their yokes, and horses tied to the wheels, &c., of the waggon. When you wish to picket horses in the middle of a sandy plain, dig a hole 2 or 3 feet deep, and tying your rope to a faggot of sticks or brushwood, or even to a bag filled with sand, bury this in it. (*See pp. 49 and 196.*)

The woodcut shows how a makeshift swivel can be fitted to a tether-rope. Without one, the rope will be twisted almost up to a knot by the horse walking round and round his picket peg ; with one, the rope will turn freely in its hole, through which its large knotted head prevents it from being drawn.



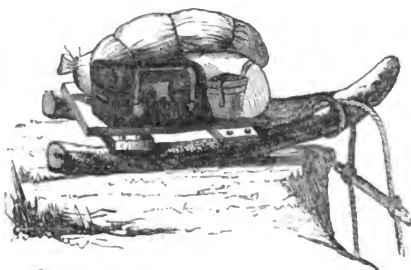
WAGGONS AND DRAUGHT HARNESS.

§ 1. Sledges, Waggons, Palanquins.

§ 2. Harness.

§ 3. Drags and Breaks.

§ 1. SLEDGES, WAGGONS, PALANQUINS, ETC.—In carrying wood or stones, and for doing other heavy work, a traveller should spare his waggon, and use a sledge. This is made directly by cutting down a forked tree, lopping off its branches, and



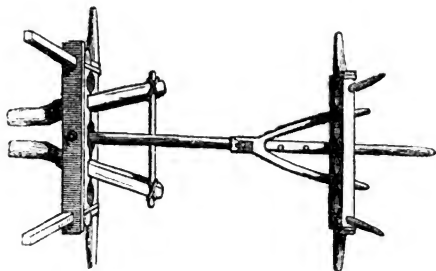
shaping it a little with an axe. If necessary, a few bars may be joined across the fork, so as to make a stage. Great distances may be travelled by one of these if the country is not very stony. Should it capsize, no great harm is done; and if it breaks down, or is found to have been badly made, another is constructed with an hour's labour. Sledges come in very usefully where there is abundance of horse or ox power, and no waggon or packing gear.

The North American-Indian plan of travelling is shown in the sketch (copied from Mr. Catlin). The poles are the hut's poles, lashed together in a somewhat triangular shape, and are attached to the horse by a breast-band and surcingle, or in



any other rude manner. The very dogs are caught and made to draw in this way.

Waggons.—A traveller's waggon should be of the simplest possible construction, and not too heavy. The Cape waggons undoubtedly share the ponderousness of all Dutch workmanship. Weight is alone required when crashing through a bushy country, where a waggon must break down all before it. In every other case it is objectionable. It is a great saving to have one large waggon rather than two small ones, because a driver and a leader are thereby spared. But if one very light waggon has to be taken, I should greatly prefer its being made on the Swiss and German fashion, with a shifting perch, as in the figure. These are the simplest of



affairs, and will split up into two carts—the pole and the fore-wheels forming one, and the perch and the hind-wheels another; and should a great loss occur among the traveller's cattle, it may be very convenient to him to abandon part of what he has, and to build up a cart for carrying on the remainder; the loss of a wheel may also compel him to do this, or even the breaking down of an axletree in a timberless country. Lady Vavasour describes one of these waggons as follows:—"The perch is moveable, and they can make it any length they please; it is of so simple a construction that every farmer can repair his own, and make anything of it. If he has a perch, a pole, and four wheels, that is enough; with a little ingenuity he makes it carry stones, hay, earth, or anything he wants, by putting a plank at each side. When he wants a carriage for pleasure, he fits it up for that purpose; his moveable perch allows him to make it anything. I counted seventeen grown persons sitting side by side, looking most happy, in one of them, drawn only by a pair of small horses, and in this hilly country."

Two-wheeled drays, and not waggons, are used very generally in Australia; a long bar is crossed by a short one near one of its ends, this latter forms the axletree, the body of the

dray is built where the two cross, and the cattle are yoked or harnessed to the long end of the bar, which acts as a pole.

Tar is absolutely essential in a hot country to mix with the grease that is used for the waggon-wheels. Grease alone melts, and runs away like water; the office of the tar is to give consistence. A very small proportion of tar suffices, but without any at all a waggon is soon brought to a standstill. It is, therefore, most essential to explorers to have a sufficient quantity in reserve. Tar is also of very great use in hot dry countries for daubing over the wheels and the woodwork generally, of waggons. During the extreme heat, when the wood is ready to crack, all the paint should be scraped off it, and the tar applied plentifully. It will soak in deeply, and preserve the wood in excellent condition, both during the drought and the ensuing wet season. (*See p. 151.*)

It is not necessary to take the wheels off in order to grease the axles. It is sufficient to bore an augur hole right through the substance of the nave, between the feet of two of the spokes, and to keep a plug in the hole. Then, in order to tar a wheel, turn it till the hole is uppermost, take the plug out, and pour the tar in.

Palanquins, carried like sedan chairs, between two animals, one going before the other in shafts, are in use in various countries, but I am not aware that explorers have ever adopted them. Their advantage would lie in combining the convenience of a cart with much of the independence of pack-horses. Whatever is lashed on a pack-saddle must be securely tied up, is severely compressed, and cannot be taken out *en route*. But with a cart or a palanquin there is no such inconvenience; things may be thrown in or taken out, pockets and drawers may be fitted up, and the place affords some shelter in rain. I should think it would be well worth while to

try a palanquin. It might be made *en route*, first accustoming the animals, when carrying their packs, to walk between long shafts, then, after some days, taking the load off their saddles, and lashing them on to the shafts. If all went well, a regular palanquin might be constructed. It should have legs, to be let down when the animals are off-packed, and on which it might stand until ready to be again carried onwards. Half a dozen palanquins in file would make a pretty, and, I should think, a manageable and effective caravan. Asses ought to be able to carry them well, and a couple of these would probably carry more than a single pack-horse, and give no greater trouble. If so, their hardihood would make them invaluable.

Porters.—Entrust instruments and fragile articles to some respectable old savage, whose infirmities compel him to walk steadily. He will be delighted at the prospect of picking up a living by such easy service.

§ 2. HARNESS.—A *horse-collar*, in its simplest form, consists of two stout bars that are a little bent or cut out; they go one on either side of the animal's neck, and are tied together both above and below it. To these bars the traces are fastened, and the bars themselves are very thickly padded.

Traces and trektows can be made of raw hide, which is cut into a long thong, then bent into three parts and twisted and laid together, as is done in rope-making; the whole is then stretched tight between two trees to dry. An ox-hide will make a trektow for four pairs of oxen. Poles of wood are very generally used as traces; a thong, or a few links of chain, being fastened at either end, by which they can be attached wherever they are wanted.

§ 3. DRAGS AND BREAKS.—Every cart and waggon in Switzer-

land, and, indeed, in the greater part of the Continent, has a break attached to it, and the simplest kind of break is shown in the sketch, which represents a cart tilted upwards. *Fig. 1* shows the break itself; *fig. 2* explains how it is fitted on to the cart. It will be seen at once that by tightening the free end of the cord, the break is pressed

Fig. 1.

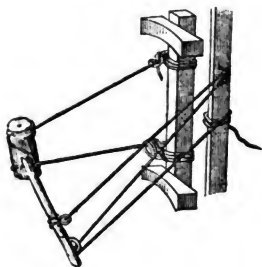
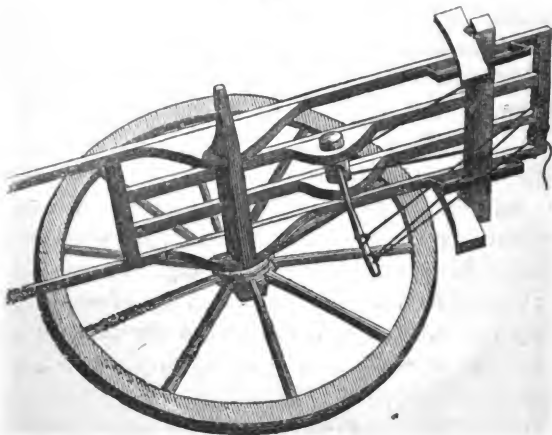


Fig. 2.



against the wheels, and of course retards the carriage. The lower part of the place in which the break-bar slides, need not be made of iron, as in the sketch; a bar of wood, or even a thong of leather, will suffice. Every explorer's waggon should be furnished with a break.



In going down a steep hill, a middling-sized tree may be felled, and its root tied to the hind axletree, while its branchy top sweeps along the ground. In the south-west of France the leaders of the team are unharnessed and taken to the back of the waggon, to which the collar of the front horse is made fast; in this way they can all aid the horses in the shafts.

In descending short steep pitches, unharness the cattle, and "fasten a rope round the axle of the waggon, then passing the other end round a tree or rock as a check, you may let her slide, which she will do without any further trouble on your part." (F. Marryat.)

Shoe the wheel on the side *furthest* from the precipice.

GUNS AND RIFLES.

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| § 1. Merits and demerits of large and small Guns.—Remarks. | § 5. Powder flask, Cap holder, Gun pricker. |
| § 2. Hanging up Guns, carrying, and cleaning them. | § 6. Matters of Sportsmanship. |
| § 3. How to dispose of Guns at night. | § 7. Gunpowder, Caps, &c. |
| § 4. Mending injuries to Guns. | § 8. Bullets and Shot. |
| | § 9. Wadding, Flints, &c. |
| | § 10. Poaching devices. |

§ 1. MERITS AND DEMERITS OF LARGE AND SMALL GUNS, ETC.—American bushrangers advocate a long heavy pea-rifle, on the plea of its accurate shooting, and the enormous saving in weight gained by using bullets of a small size. The only objections to small-bored rifles are those of insufficiency against very large game, even when conical bullets are used,—and a tendency to become foul after a very few shots. A short light rifle, whether with a large or a small bore, is, I believe, utterly worthless. In the hands of a man trembling with running and with exhaustion it shakes like a wand; and the shorter the rifle, the more quickly does it oscillate, and in the very same proportion is it more difficult to catch the exact moment when the sights cover the object.

When plenty of ammunition can be carried, a No. 12 bore (that is to say, one such that twelve of the bullets that fit it go to a pound) is found the most convenient of any, both for guns and rifles. No. 17 is certainly too small, and No. 10 unnecessarily large. (I speak of round bullets.)

Therefore, for a man carrying the least possible weight, I should recommend a long, heavy, two-barrelled rifle, of from

60 to 80 bore, or even still smaller; but for one able to carry sufficient ammunition, light long guns of No. 12 bore, and a long, heavy, double-barrelled rifle of the same size. Opinions differ on the mode of rifling most convenient to a traveller. The old-fashioned many-grooved rifle has the advantage of carrying the very same bullets as the gun; the others, that of easier loading.

In elephant-shooting, Ceylon sportsmen use enormous guns, and with them they kill elephants with single shots; while in Africa, sportsmen, with ordinary-sized weapons, average no less than twenty shots at each elephant—though Mr. Andersson has, by shooting them behind the fore-legs at very close quarters, occasionally shot them dead. Details of Ceylon sport are given in “The Rifle and the Hound in Ceylon,” the author of which advocates a single-barrelled rifle, carrying a 4-oz. bullet (No. 4 bore), and weighing 21 lbs.

In all cases the hind sight should be far from the eye, even half-way down the barrel, else it becomes quite out of focus and indistinct, when the eye is firmly set on the object aimed at, and this drawback much more than compensates for any advantage that is gained by having the front and hind sights far asunder.

All servants' guns, and indeed those of their masters, should have thin soft-iron ramrods; the bend of these will retain them in the ramrod-tubes; their ends must be forged broad.

In common guns, the screw by which the cock is secured in place, is very liable to get loose, fall out, and be lost; one or more spare ones should certainly be taken.

§ 2. HANGING UP GUNS, CARRYING, AND CLEANING THEM.—Fix “a loop of leather for the muzzle, and a strap and buckle for the stock, with a piece of sheepskin or canvas nailed so as

to hang over it." But a more complete way is to sew a long pocket with a flap to it, which is tied up on to a stick or bar. The gun need simply be lifted out and in. The pocket is made baggy at the part which corresponds to the cocks of the gun.



Waterproof covers should always be taken. A broad leaf wrapped loosely round the locks of a gun will protect it during a heavy shower.

Carrying guns.—"Look at the gun, but never let the gun look at you, or at your companions," is a golden rule; for among the chances of death to which a traveller is exposed, that of being shot by an attendant's gun going off accidentally ranks high. Servants had best carry their guns with the cock down on a piece of rag that covers the cap: take it all in all, it is the best for them. A sportsman will find great convenience in having a third nick cut in the tumbler of his lock, so as to give an additional low half-cock, at which the cock just clears the nipple, and prevents the cap from tumbling off or receiving a blow. I have long used this plan, and find no objections whatever to it: many pistols are made so. Careless gun-makers sometimes make this half-cock so low, that when the cock is lifted a little back and let go, it strikes the cap by reason of the elasticity of the metal, and lets the gun off; this should be looked to.

As this book may fall into the hands of persons ignorant of the danger of carrying a gun with the cock down on the nipple (to which cause I find, by a list that I used to keep, that three-fourths of gun accidents are owing), I will remark that in a gun so circumstanced, a heavy blow on the back of

the cock will explode the cap, nay, even the jar caused by a gun falling on the ground will do so; or else, that if the cock catch against part of the dress, or against a twig, it will be pulled a little back, and on being released snap down on the cap, and will in this way, also, explode it. When a gun is at half-cock, neither of these things can happen—the first obviously not; and if the cock be pulled back and let drop, it falls, not down upon the cap, but to half-cock again, except only in the case where the trigger is also pressed back. The objections to carrying a gun on half-cock are, that careless people may occasionally leave it on full-cock and not perceive the difference, and also a probability of weakening its mainspring, if day after day it be kept on the strain.

Carrying guns on horseback.—Sew a bag of canvas, leather, or hide, of such a bigness as to admit the butt of the gun pretty freely. The straps that support it buckle through a ring in the pommel, and the thongs by which its slope is adjusted fasten round the girth below. The exact adjustments may not be hit upon by an unpractised person for some little time, but when they are once ascertained the straps need never be shifted. The gun is perfectly safe, and never comes below the armpit, even in taking a drop leap; it is pulled out in an instant by bringing the elbow in front of the gun and close to the side, so as to throw the gun to the outside of the arm; then lowering the hand, the gun is caught up. It is a bungling way to take out the gun whilst its barrel lies between the arm and the body. Any sized gun can be carried in this fashion. It offers no obstacle to mounting or dismounting. It is the invention of the Namaquas.

I hear that some sportsmen, who were probably unacquainted with this method, have used a bag or pocket of stiff

leather attached to the side of the saddle, just behind the right leg; into this, when tired of carrying the gun, they push its butt. It is said to lie there securely and to give no



trouble, the barrel passes forwards under the right arm, and the muzzle is in front of the person.

The French dragoons carry a gun in a convenient way for military purposes, because it does not interfere with the immense housings that cavalry soldiers require; but it is not so handy nor so free as the above, nor as well suited for a traveller or a sportsman. The gun is butt downwards as in the Namaqua method, and leans backwards in the same way, but

the under side of the gun, instead of being backwards, or towards the horse's tail, is towards his head. The butt lies in a shallow bucket, secured by two straps fixed to the front of the saddle; another strap, leading from the pommel, and passing over the right thigh of the rider, is hitched round the barrel of the gun, and has to be unbuckled and cast off when the gun is taken out.

All ways of carrying the gun with its muzzle downwards are very objectionable, since the jolting tends to dislodge the charge, and risks bursting the gun. A very little shaking in that position will shake the powder out of the nipple, and a gun, so carried, will constantly miss fire.

Gun cleaning.—A bit of rag does as well as tow, and can be used over and over again. A top to the cleaning-rod, with a sponge to it, is convenient. "A leaded barrel must be cleaned with fine sand." (Hawker.) Quicksilver, if it be at hand, will dissolve out the lead at once.

Mercurial ointment is perhaps the best thing to keep rust off iron, as at sea, or in boats. Before embarking for a voyage, it is convenient to inclose the guns in a leaden case, which, on its arrival, can be melted up into bullets. It is remarkable how much better dirty guns withstand rust than clean ones.

§ 3. HOW TO DISPOSE OF GUNS AT NIGHT.—A gun is a very awkward thing to dispose of at night. It has occurred more than once that a native servant has crept up and drawn away his sleeping master's gun and shot him dead. The following appears to me an excellent plan:—"When getting sleepy, you return your rifle between your legs, roll over, and go to sleep. Some people may think this is a queer place for a rifle; but, on the contrary, it is the position of all others where utility and comfort are most combined. The butt rests on the arm, and serves as a pillow

for the head; the muzzle points between the knees, and the arms encircle the lock and breech, so that you have a smooth pillow, and are always prepared to start up armed



at a moment's notice." (Parkyns' "Abyssinia.") The longer the gun, the more secure is the sleeper from accident.

§ 4. MENDING INJURIES TO GUNS.—*Ramrod tubes* often break off, and it is a great inconvenience when they do so. I know of no contrivance whatever to fasten them on again, except by using soft solder, which will not in the least hurt the gun; ashes, at a dull red heat, must be heaped over the barrel to warm it sufficiently before applying it. If they be lost, tin tubes may replace them.

The sight of a gun, if it falls out and is lost, can easily be restored. A groove must be cut with a file across the substance of the barrel if the gun be a single one, or across the

mid rib if double-barrelled; into this a piece of iron, ivory, bone, horn, or hard wood, with a projection carved in the middle for the sight, must be pushed, and the metal battered down over it with a hammer or stone, to keep it firm.

A broken stock, however much it may be smashed, can be well mended by raw hide (p. 136). Blacksmith's work and carpentering is seldom sufficient for the purpose. It is within the power of a rough workman to make a gun-stock, but it is a work of great labour to him.

A broken ramrod is to be replaced by cutting a stick from a tree, straightening it in the fire, and then seasoning it. (See p. 137.)

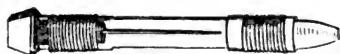
§ 5. POWDER FLASK, CAP HOLDER, GUN PRICKER.—*Powder flask*.—It is convenient to carry a very small but roomy flask. The large one, in reserve, may be put in a bag at the front of the saddle.

Powder horn.—Saw off the required length from an ox's horn, flatten it somewhat by heat (p. 146), fit a wooden bottom into it, caulk the side of it well, and sew raw hide round the bottom edge to keep all tight. The mouth must be secured by a plug, which is sometimes hollowed out to make the charger. Hollow canes and old gunpowder canisters, sewn up in hide, make powder flasks.

Caps are very conveniently carried by a contrivance which, being old-fashioned and not well suited for sportsmen in England, is rarely to be met with; but as it never gets out of order, it is excellent for travellers. I allude to a ring with two dozen nipple-shaped beads strung on it, each bead being intended to carry a percussion cap. The whole is made of metal; the beads being cleft down the middle have a slight springiness, which more effectually secures the caps that are placed upon them; the ring is tied by a thong to the belt or

button-hole. It is very difficult without this contrivance to keep caps free from sand, crumbs, and dirt, yet always ready for use. I can confidently recommend it. Spring cap holders are, I am sure, too delicate to be trusted in rough travel. Before stalking, or watching at night in rainy weather, wax the edge of the cap as it rests on the nipple; it will thus be proof against water and damp air. Some persons carry a piece of grease with them when out shooting in wet weather, and with it they smear the top of the nipple after each loading and before putting on the fresh cap. It is said that this does not prevent the full action of the cap upon the powder. One sportsman has recommended to me a couple of well-marked caps, into the heads of which small wads of cork had been fitted; he uses them for loaded guns that have to be laid by for some hours or days.

Gun pricker.—I am indebted for the following plan, both for clearing the touchhole, and also for the rather awkward operation of pricking down fresh gunpowder into it, to an old sportsman in the Orkney Island of Sanday. He takes a quill, and cuts off a broad ring from the large end of it; this is pushed over the small end of the quill and lies securely there. Next, he cuts a wooden plug to fit the quill, and into the plug the pricker, whatever it may be, is fixed. The whole affair goes safely in the pocket, the quill acting as a sheath to the sharp pricker. Now, when powder has to be pricked



down the nipple, the "broad ring" is slipped off the quill and put on the nipple, which it fits; powder is poured into it, and the rest of the operation is done directly. This little contrivance, which lasts for months, and is so simple and light, is

perfectly effective. I have tried metal ones, but owing to their want of elasticity and lightness I much prefer the simple quill. A little binding with waxed thread may be put on, as shown in the sketch, to secure the quill from splitting.

§ 6. MATTERS OF SPORTSMANSHIP.—*Loading when lying down.*—Put in the powder as you best can, and ram the bullet home, lying flat on your back, with the barrel of the gun athwart your breast. It is easy to load in this way with cartridges.

Loading on horseback.—Empty the charge of powder from the flask into the left hand, and pour it down the gun; then take a bullet wet out of your mouth and drop it down the barrel, using no ramrod; the wet cakes the bullet fairly in its place. “The quickest way of firing is to carry the powder loose in a left-hand pocket, and to use a flint self-priming gun. In firing, do not bring the gun to your shoulder, but present it across the pommel of the saddle, calculating the angle with your eye, and steadying yourself momentarily by standing in the stirrups as you take aim. By practice a man shoots very accurately in this way.” (Palliser.)

Stalking game.—In creeping after game, the gun is always troublesome; there is no better plan than pushing it as far as the arm can reach, then creeping up to it, and again pushing it forwards.

Tracks.—When the neighbourhood of a drinking-place is trodden down with tracks, “describe a circle a little distance from it, to ascertain if it be much frequented. This is the manner in which spoor should at all times be sought for.” (Cumming’s “South Africa.”) To know if a burrow be tenanted, go to work on the same principle; but if the ground be hard, sprinkle sand over it, in order to show the tracks more clearly. It is related in the Apocrypha that the prophet Daniel did this when he wished to learn who it really was that every

night consumed the meat which was placed before the idol of Bel, and which the idol itself was supposed to eat. He thus discovered that the priests and their families had a secret door by which they entered the temple; and convinced the king of the matter by showing him their footprints.

For night-shooting, a band of white paper must be tied round the muzzle of the gun, behind the sight; and Mr. Andersson, who has had very great experience in this, ties the paper, not round the smooth barrel, but round the sight and all; and if the sight does not happen to be a large one, he ties a piece of thick string round the barrel, or uses other similar contrivance, to tilt up the fore end of the paper, effectively. By this means the paper is not entirely lost sight of at the moment when the aim is being taken; otherwise, it is. Mr. Andersson, also, pinches up the paper along the middle of the gun; by doing this, he ensures a more defined foresight.

In the great *battues* of Sweden, where hundreds of people are marshalled, each man has a number, and the number is *chalked* upon his hat.

A string with feathers tied to it at intervals, like the tail of a boy's kite, will by their fluttering scare most animals of the deer tribe; and in want of sufficient persons, passes may be closed by these.

Mr. Lloyd tells us of a peasant who, when walking without a gun, saw a glutton up in a tree. He at once took off his hat and coat and rigged out a scarecrow, the counterpart of himself, which he fixed close by, for the purpose of frightening the beast from coming down, and then went leisurely home, and fetched his gun; this notable expedient succeeded perfectly.

In boat shooting, a landing-net should be taken, as Colonel

Hawker well advises, to pick up the dead birds as they float on the water, while the boat passes quickly by them.

When shooting from a river bank without boat or dog, take a long light string with a stick tied to one end of it, the other being held in the hand. By throwing the stick beyond the floating bird, it can gradually be drawn in.

Claims on game that is shot.—Some rules are necessary in these matters to avoid disputes, especially between whites and natives; and therefore the custom of the country must be attended to. But it is a very general and convenient rule (though like all fixed rules often unfair) that the animal should belong to the man who first wounded him, however slight the wound might have been; but that he or they who actually killed the animal should have a right to a slice of the meat: it is a further condition, that the man who gave the first wound should not thenceforward withdraw from the chase; if he does so, his claim is lost. Whaling crews are bound by similar customs, in which nice distinctions are made, and which have all the force of laws.

In America the skin belongs to the first shot, the carcase is divided equally among the rest.

When you have shot an animal on a bare plain, you may tie your horse to his horns while you skin him, but it is better to hobble him with a stirrup-leather.

To carry small game, such as fallow deer.—Make a long slit with your knife between the back sinews of both hind-legs and the bone. Cut a thick pole of wood and a stout wooden skewer 8 inches long. Now thrust the right fore-leg through the slit in the left hind one, and then the left fore-leg through the slit in the right hind one, and holding these firmly in their places, push the skewer right through the left fore-leg, so as

to peg it from drawing back. Lastly, run the pole between the animal's legs and its body, and let two men carry it on their shoulders, one at each end of the pole; or if a beast of burden be at hand, the carcase is in a very convenient shape for being packed. In animals whose back sinew is not very prominent,



it is best to cross the legs as above, and to lash them together. Always take the bowels out of game before carrying it; it is so much weight saved. "I rode out accompanied by an after-rider, and shot two spring-boks, which we bore to camp secured on our horses behind our saddles, by passing the buckles of the girths on each side through the fore and hind legs of the antelopes, having first performed an incision between the bone and the sinews with the *couteau-de-chasse*, according to colonial usage." (Cumming's "Life in South Africa.") "After he had skinned and gutted the animal, he cut away the flesh from the bones, in one piece, without separating the limbs, so as to leave suspended from the tree merely the skeleton of the deer. This, it appeared, was the Turkish fashion in use upon long journeys, in order to relieve travellers from the useless burden of bones." (Huc's "Tartary.")

To hide dead game from birds of prey, bush it over. (See pp. 67, 98.)

Duck-shooting.—Wooden ducks, ballasted with lead, and painted, may be used at night as decoy ducks, or the skins of birds already shot taken off and stuffed. They should be anchored in the water or made fast to a frame attached to the punt, and dressed with sedge. It is convenient to sink a large barrel into the flat marsh or mud, as a dry place to stand or sit in. If real ducks be used as decoy birds, the males should be tied in one place and the females in another, to induce them to quack.

An artificial island may be made to attract ducks, when there is no real one.

§ 7. GUNPOWDER, CAPS, &c.—It is difficult to make good gunpowder, but there is no skill required in making powder that will shoot and kill. The negroes of Africa make it for themselves, burning the charcoal, gathering saltpetre from

salt-pans, and buying the sulphur from trading caravans; they grind the materials on a stone. In Chinese Tartary and Thibet every peasant manufactures it for himself.

To make 8 pounds of gunpowder, take—

1 lb. of charcoal,
1 lb. of sulphur, and
6 lbs. of saltpetre.

These proportions should be followed as accurately as possible. Each of the three materials must be pounded into powder separately, and then all mixed together most thoroughly. The mixture must have a little water added to it, enough to make it bind into a stiff paste (about one-tenth part, by measure, of water is sufficient; that is to say, one cupful of water to ten cupfuls of the mixed powder). This paste must be well kneaded together with one stone on another, just as travellers usually make meal or grind coffee. It should then be wrapped up in a piece of canvas, or a skin, and pressed, with as heavy a pressure as can be obtained, to condense it. Next, the cake is squeezed and worked against a sieve made of parchment punched full of small holes, through which the cake is squeezed in grains. These grains are now put into a box, which is well shaken about, and in this way the grains rub each other smooth. The fine dust that is then found mixed with the grains must be winnowed away; lastly, the grains are dried.

Recapitulation.

1. Pound the ingredients separately.
2. Mix them.
3. Add a little water, and knead the mass.
4. Press it.

5. Rub the mass through a sieve.*
6. Shake up the grains in a box.
7. Get rid of the dust.
8. Dry the grains.

The ingredients should be used as pure as they can be obtained.

To procure good charcoal.—Light woods that give a porous charcoal are the best, as poplar, alder, lime, horse-chestnut, willow, hazel-nut, elder, &c. It should be used as soon as possible after it is made, and made with the greatest care. It is the most important ingredient in gunpowder. (*See* p. 150.)

Sulphur.—The lumps must be melted over a gentle fire; the pot should then be put in a heap of hot sand, to give the impurities time to settle before it cools into a mass. When this has taken place, the bottom part must be broken off and put aside as unfit for making gunpowder, and the top part alone used. Flour of sulphur is quite pure.

Saltpetre.—Dissolve the saltpetre that you wish to purify in an equal measure of boiling water; a cupful of one to a cupful of the other. Strain this solution, and letting it cool gradually, somewhat less than three-fourths of the nitre will separate in regular crystals. Saltpetre exists in the ashes of many plants, of which tobacco is one; it is also found copiously on the ground in many places, in saltpans, or simply as an efflorescence. Rubbish, such as old mud huts, mortar, &c., generally abounds with it. (It is made by the action of the air on the potash contained in the earths.) The

* For making a few charges of coarse powder the sieve may be dispensed with: in this case, roll the dough into long pieces of the thickness of a pin; lay several of these side by side, and mince the whole into small grains; dust with powder to prevent their sticking together, and then proceed as described.

taste, which is that of gunpowder, is the best test of its presence. To extract it, pour hot water on the mass, then evaporate and purify as mentioned above. (*See* p. 26.)

Substitute for caps.—When the revolution in Spain (1854) began, “there was a great want of percussion caps; this the insurgents supplied by cutting off the heads of lucifer-matches and sticking them into the nipples. The plan was found to answer perfectly.” (*Times*, July 31.)

Carry your gunpowder wrapped up in flannel or leather, not in paper, cotton, or linen, because these will catch fire, or smoulder like tinder, whilst the former will do neither the one nor the other. Gunpowder carried in a goat-skin bag travels very safely.

Rocket composition is

Gunpowder 16 parts, by weight.

Charcoal 3 parts.

Or, in other words,—

Nitre 16 parts.

Charcoal 7 parts.

Sulphur 4 parts.

It must not be forgotten, that when rockets are charged with the composition, a hollow tube is left down the middle of it.

	{	4 parts gunpowder meal.
Blue fire		2 „ nitre.
		3 „ sulphur.
		3 „ zinc.
Bengal fire	{	7 „ nitre.
		2 „ sulphur.
		1 „ antimony.

§ 8. BULLETS AND SHOT.—Travellers frequently omit to take enough shot; it is a great mistake not to do so, as birds are always to be found, while large game is uncertain; besides this, shot gives amusement, and ducks, quails, and partridges are much better eating than antelopes and buffaloes. It must be borne in mind that a rifle will carry shot quite well enough on an emergency.

Sportsmen fresh from England begin by shooting vilely with balls; but they must not be discouraged at what is a general rule.

Bullets of lead are far inferior to those of hard alloy; for the latter penetrate much more deeply, and break bones, instead of flattening against them. A mixture of a very little tin or pewter (which is lead and tin) with lead hardens it. We read of sportsmen melting up their spoons and dishes for the purpose. A little quicksilver has the same effect. But proper alloy or spelter had best be ordered at a gun-maker's shop, and taken instead of lead. Different alloys of spelter vary considerably in their degree of hardness, and therefore more than one specimen should be tried. Round iron bullets are worthless, except at very close quarters, for on account of the lightness of the metal, the resistance of the air checks their force extremely. Whether elongated iron bullets would not succeed, remains to be tried. Some savages, as for instance those of Timor, when in want of bullets, use stones two or three inches long. Bullets should be carried sewn up in their patches, for the convenience of loading, and they should not fit too tight; a few may be carried bare for the sake of rapid loading. Some good sportsmen insist on the advantage, when shooting at very close quarters, of cleaving a Minie bullet nearly down to its base, into four parts; these partly separate, and are said to make a fearful wound. I suppose that the

bullet leaves the gun with the same force as if it were entire ; and that it traverses too short a distance for its altered form to tell seriously upon its speed : when it strikes, it acts like chain shot. Where ammunition is scarce, make a practice of recovering the bullets that may have been shot into a beast. Spelter bullets are found to be very little knocked out of shape, and may often be used again without re-casting.

Shot.—Probably No. 7 is the most convenient size, as the birds are likely to be tame, and also because a traveller can often fire into a covey or dense flight of birds, and the more pellets the more execution. If birds are to be killed for stuffing, dust-shot will also be wanted ; otherwise, it is undoubtedly better to take only one size of shot. Slugs are wanted both for night-shooting and also in case of a hostile attack. “ Shot can hardly, in practice, be cast by a traveller. We beat the lead quite flat, and cut it into bars about one-eighth of an inch square, which we divided across so as to form little cubes one-eighth of an inch every way (minced lead like minced meat). These we made as like grains of shot as we could by putting them into a small metal boiler in the kitchen of the Fort, and rolling them round and round with a smooth stone along with some ashes.” (Palliser.)

Shot is thus made in manufactories. Arsenic is added to the lead in the proportion of from 3 lbs. to 8 lbs. of arsenic to 1000 lbs. of lead. If the shot is lens-shaped, there is too much arsenic ; if hollow, flattened, or tailed, there is too little. Pewter or tin is bad, as it makes tailed shot. The melted lead is poured through cullenders drilled with *very fine* holes, and drops many feet down into a tub of water ; 100 feet fall is necessary for manufactories in which No. 4 shot is made ; 150 for larger sorts. The shot are sorted by sieves, and bad shot are weeded out by letting the shot roll over a slightly-

inclined board, when the shot that are not quite round are left on the board. Next, the shot is smoothed by being shaken up in a barrel with a little black-lead.

§ 9. WADDING, FLINTS, &c. — *Wadding*.—The bush affords but little of which wadding can be made, though some birds' nests are excellent for the purpose, and possibly a dry hide might serve, if punched into wads.

Flints.—According to Ure's Dictionary, the best to choose for gun-flints are those that are not irregular in shape; they should have, when broken, a greasy lustre, and be particularly smooth and fine-grained; the colour may be anything, but should be uniform in the same lump, and the more transparent it is the better. Gun-flints are made with a hammer and a chisel of steel that is not hardened. The stone is chipped into pieces of the required thickness by the hammer alone, and these are fashioned by being laid upon the fixed chisel and hammered against it. It takes nearly a minute for a practised workman to make one gun-flint.

Olive oil, to purify.—Put a piece of lead in the bottle and expose to the sun, when a quantity of cloudy matter will separate after a few days, and the fine oil may be decanted off.

§ 10. POACHING DEVICES. — A stalking-horse, cow, &c., is made by cutting out a piece of strong canvas into the shape of the animal, and painting it properly. Then by sewing loops in different places, it can be stretched into shape by a few sticks; one other stick props up the whole, and at the proper height is a loop-hole to fire through. The entire thing packs up into a roll of canvas and a bundle of five or six sticks. Bushes are used in much the same way. Colonel Hawker made a contrivance upon wheels, which he pushed before him. Both horses and oxen can be trained so

as to shield a sportsman; they are said to enter into the spirit of the thing, and to show wonderful craft, walking round and round the object in narrowing circles, and stopping to graze unconcernedly on witnessing the least sign of alarm. Oxen are taught to obey a touch on the horn.

Pan-hunting (used at salt-licks).—"Pan-hunting is a method of hunting deer at night. An iron pan, attached to a long stick serving as a handle, is carried in the left hand, over the left shoulder; near where the left hand grasps the handle, is a small projecting stick, forming a fork on which to rest the rifle when firing. The pan is filled with burning pine-knots, which being saturated with turpentine, shed a brilliant and constant light all round, shining into the eyes of any deer that may come in that direction, and making them look like two balls of fire. The effect is most curious to those unaccustomed to it. The distance between the eyes of the deer, as he approaches, appears gradually to increase, reminding one of the lamps of a travelling carriage." (Palliser.)

Setting a gun as a spring gun.—The stock is firmly lashed to a tree, and the muzzle to a stake driven into the ground; then a stick eight inches long is bound across the grip of the gun-stock, but not so tightly as to prevent its being a little moveable. The bottom of this stick and the trigger are connected with a short fine string, while from its top a long string is passed through the empty ramrod-tubes and tied to the other side of the pathway, at the point covered by the gun. It is evident that when the beast breasts this string the gun will go off; and the string must be so fine that if he struggles against it, the string will give way rather than break the gun. The height of the muzzle should be properly arranged with regard to the height of the expected animal. Thus, the heart of a hyena is the height of a man's knee above the

ground, that of a lion a span higher. The string should not be tight, but hang in a bow, or the animal will fire the gun on



first touching it, and receive only a flesh-wound across the front of his chest. By adjusting the leverage of the stick,

this arrangement can be made very delicate, and easy to go off. Mr. Palliser uses a single string, which being tied to the trigger, passes round a piece of polished stick, that is fixed behind it (? lashed within the trigger-guard), and is then carried forwards across the path. It would in all cases much facilitate matters if every common gun that was taken by the party had a hole drilled through the tip of the trigger for tying the string, and another through the back of the trigger-guard for admitting it. The Chinese have some equivalent contrivance with bows and arrows. Mr. Huc tells us that a simply-constructed machine is there sold in the shops, by which, when sprung, a number of poisoned arrows are fired off in succession. These are planted in caves of sepulture, to guard them from pillage. They use spring guns, and used to have spring bows, in Sweden, and in many other countries.

TRAPPING.

§ 1. Springes.

§ 2. Pitfalls, Traps, &c.

§ 3. Poison.

§ 4. Bird-lime.

§ 5. Bolas and Lasso.

A trapper will never succeed unless he thoroughly enters into the habits of life and mind of wild animals. He must ever bear in mind how suspicious they are; how quickly their eye is caught by unusual traces; and lastly, how strong and enduring a taint the touch of man leaves behind it. Our own senses do not make us aware of what is disagreeable enough to confess—that the whole species of mankind yields a powerful and wide-spreading emanation that is utterly disgusting and repulsive to every animal in its wild state. It requires some experience to realise this fact; a man must frequently have watched the heads of a herd of far-distant animals tossed up in alarm the moment that they catch his wind. He must have observed the tracks of animals—how, when they crossed his own of the preceding day, the beast that made them has stopped, scrutinised, and shunned it—before he can believe what a Yahoo he is among the brute creation. No cleanliness of the individual seems to diminish this remarkable odour; indeed, the more civilised the man, the more subtle does it appear to be; the touch of a gamekeeper scares less than that of the master, and the touch of a negro or bushman less than that of a traveller from Europe.

If a novice thinks he will trap successfully by such artless endeavours as, for instance, by putting a bait on the plate of

a trap that is covered over with moss, or by digging a pitfall in the middle of a wild beast's track, he is utterly mistaken. The bait should be thrown on the ground, and the trap placed near it, along the most likely way to it; then the animal's mind, being fixed on the meat, takes less heed of the footpath. Or a pitfall should be made near the main path: this being subsequently stopped by boughs, causes the animal to walk in the bushes, and to crash through the covered hole. The slightest thing diverts an animal's step: watch a path across a forest—little twigs and tufts of grass will be seen to have changed its course, and caused it to curve. It is in trifles of this sort that the trapper looks for auxiliaries.

§ 1. SPRINGES.—Though every school-boy can set one, I may remark, that the slighter the strain the more delicately can it be set, and also that a twig should be bent across the path in front of it, or other means taken to induce the animal to step over, and put his foot down exactly where you intend. Catgut (p. 145) makes better nooses than string, because it is stiff enough to keep from twisting out of shape when set; and brass wire that has been heated red hot, is excellent, for it has no tendency whatever to twist, and yet is perfectly pliable. Springes are sometimes set with fish-hooks, sometimes a tree is bent down and a cord used, by which large animals are strangled up in the air, as leopards are in Abyssinia. After setting traps, Mr. St. John recommends the use of a small branch of a tree; first, to smooth the ground, and then having dipped it in water, to use it to sprinkle the place; this entirely obliterates all foot-marks.

Heavy poisoned javelins, hung over elephant and hippopotamus paths, and dropped on a catch being touched, after the manner of a springe, are used generally in South Africa. They sometimes consist "of a sharp little assegai, or spike,

most thoroughly poisoned, and stuck firmly into the end of a heavy block of thornwood, about 4 feet long and 5 inches in diameter. This formidable affair is suspended over the centre of a sea-cow path, at about 30 feet from the ground, by a bark cord, which passes over a high branch of a tree, and thence, by a peg, on one side of a path beneath." (Gordon Cumming.)

Where a trigger has to release a strong spring, one on the principle of a figure of 4 trap is, I believe, the most delicate. The standard may be a branch or the stock of a tree.

Noosing ducks.—We hear of Hindoos who, taking advantage of the many calabashes floating on their waters, put one on their heads, and wade in among wild ducks, and pull them down, one after another, by their legs, under water, wringing their necks and tying them to their girdle. But in Australia a swimmer binds grass and rushes, or weeds, round his head, and takes a long fishing-rod, with a slip-noose working over the pliant twig that forms the last joint of the rod. When he comes near, he gently raises the end, and, putting the noose over the head of the bird, draws it under water to him. He thus catches one after another, and tucks the caught ones in his belt. A windy day is generally chosen, because the water is ruffled. (Eyre.)

A noose may be set in any place where there is a run; it can be kept spread out by thin rushes or twigs set cross-wise in it. If the animal it is set for can gnaw, a heavy stone should be loosely propped up, which the animal in its struggles may set free, and by the weight of which it may be hung up and strangled. It is a very convenient plan for a traveller who has not time to look for runs, &c., to make little hedges across a creek, or at right angles to a clump of trees, or to an island, and to set his snares in gaps left in these artificial hedges.

§ 2. PITFALLS, TRAPS, &c.—Very small ones, with sharpened stakes, baked hard by the fire and well poisoned, are easily set, but are very dangerous to man and beast. In digging a pitfall for animals of prey, it is usual to ascertain if they are made deep enough by putting a large dog in; if he cannot get out, it is very unlikely that any wild beast can.

Pitfalls are often dug in great numbers near a frequented watering place to which numerous intersecting paths lead; then, by stopping up particular paths, any one or no pitfall can be brought into use, and the game are not scared by the smell of one in which animals have been freshly killed. It is difficult to prevent the covers of pitfalls becoming hollow; the only way is to build their roof in somewhat of an arch, so as to allow room for subsidence. If a herd of animals be driven over pitfalls, some are sure to be pushed in, as the crush makes it impossible for the beasts, however wary, to pick their way.

Traps.—Steel traps should never be tied fast, or the caught animal may struggle loose, or even gnaw his leg off. It is best to cut small bushes, and merely to tie the traps to their cut ends. They are of but little use to a traveller.

Condors and vultures are caught by spreading a raw ox-hide, and creeping under it with string, while one or two other men are posted in ambush close by. When the bird flies down upon the bait, his legs are seized, and bound tight in the skin, as in a bag. All his flapping is then useless.

Hawks are trapped by selecting a bare tree that stands in an open space; its top is sawn off level, and a trap put on it. The bait is laid somewhere near, on the ground, and the bird is sure to visit the pole either before or after he has fed.

§ 3. POISON.—Savages frequently poison the water of drinking places, and follow, capture, and eat the poisoned animals. Nuxvomica or strychnine is very dangerous to use, but it affords the best means of ridding a neighbourhood of wolves, hyenas, &c.; if it be employed to kill beasts, put it in the belly; if birds, in the eye, of the bait. If pieces of meat be used with a view to killing beasts, they should be set after nightfall, else the crows and other birds will be sure to find them out and eat them up before the beasts have time to discover them. It would never be safe to eat an animal killed with strychnine, on account of the deadliness of the poison. The Swedes put fulminating powder in a raw shankbone, and throw it down to the wolves; when one of these gnaws and crunches it, it blows his head to atoms.

Arrows are best poisoned by steeping a thread in the juice, and wrapping it round the barbs. Serpent's venom may always be used.

§ 4. BIRD-LIME can be made from the middle bark of most parasitic plants, that is to say, those that grow, like misletoe, out of the boughs of other trees. Holly and young elder shoots also afford it. The bark is boiled for seven or eight hours, till quite soft, and then drained of its water and laid in heaps in pits dug in the ground, where it is covered with stones, and left for two or three weeks to ferment. But less time than this is required if the weather be hot. It is watered from time to time if necessary. In this way it passes into a mucilaginous state, and is then pounded into a paste, washed in running water, and kneaded till it be free from dirt, chips, &c. Lastly, it is left for four or five days in earthen vessels, to ferment and purify itself, when it becomes fit for use. It ought to be greenish, sour, gluey, stringy, and sticky. It becomes

brittle when dry, and may be powdered; but on being wetted it becomes sticky again. (Ure's Dictionary.)

Vast flocks of birds frequent at nightfall and at daybreak the scattered watering places of dry countries; by liming the sedges and bushes that grow about them, numbers of these could be caught.

Crows may be killed by twisting up a piece of paper like an extinguisher, dropping a piece of meat in it, and smearing its sides with bird-lime. When the bird pokes his head in, his eyes are gummed up and blinded, and he flies straight up in the air, but soon falls down exhausted, and it may be dead with fright. (Lloyd.) Fish-hooks, baited with meat, are good to catch these sort of birds.

§ 5. BOLAS AND LASSO.—“The bolas consist of three balls, composed either of lead or stone, two of them heavy, and the third rather lighter. They are fastened to long elastic strings, made of twisted sinews, and the opposite ends of the strings are all tied together. The Indian holds the lightest of the three balls in his hand, and swings the two others in a wide circle above his head; then taking his aim, at the distance of about 15 or 20 paces, he lets go the hand-ball, upon which all the three balls whirl in a circle, and twine round the object aimed at. The aim is usually taken at the hind legs of the animals, and the cords twisting round them, they become firmly bound. It requires great skill and long practice to throw the bolas dextrously, especially when on horseback. A novice in the art incurs the risk of dangerously hurting either himself or his horse by not giving the balls the proper swing, or by letting go the hand-ball too soon.” (Tscudi's “Peru.”)

It is impossible to learn the use of the lasso without months of practice and instruction. (See p. 161.)

Hawking is a disappointing pursuit, from the frequent loss of hawks ; and can hardly be carried on except in a hawking country, where the sportsman has a better chance both of recovering and replacing them, and is quite impracticable except where the land is open and bare ; it is quite a science. The birds are rarely affectionate or intelligent.

FISHING.

§ 1. Fishing-tackle.

§ 2. Spearing Fish—Intoxicating them.

§ 3. Otters and Cormorants.

§ 1. FISHING-TACKLE.—A traveller should take very small, and also middling-sized, hooks; he might have a dozen of each sort whipped on to gut; and at least a couple of casting lines; also several dozens of tinned iron fish-hooks of various sizes, such as are used at sea, with plenty of line.

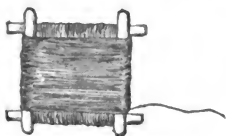
Fish-hooks are made of iron, not steel, wire. While the piece is straight, it is laid along a little groove in a block of wood, and there barbed by the stroke of a chisel slantwise across it. The other end is flattened by a tap of the hammer, or roughened, that it may be held by the whipping; then the point is sharpened by a file, and on a stone. The proper curvature is next given, and lastly the hook is case-hardened (see *Case-hardening*); proper temper is given by heating the hook red hot, and quenching it in grease.

Gut is made from silk-worms, but the scrapings of the membrane in the manufacture of catgut make a fine, strong, and somewhat transparent thread, and twisted horsehair can always be had. Boiling this in soap-lees takes away its oiliness.

Reel.—If you have no reel, make a couple of gimlet holes,



6 inches apart, in the butt of your rod, at the place where the reel is usually clamped; drive wooden pegs into these, and wind your spare line round them. The pegs should



not be quite square with the butt, but should slope a little, each away from the other, that the line may be better retained on them. A long line is conveniently wound on a square

frame, as shown in the annexed sketch.

Trimmers are well known, and are a convenient way of fishing the middle of a pool with only a short line. Anything will do for the float—a bladder is very good.

Otters.—What is called “an otter” may supply the traveller with food. A board of light wood, 14 inches long and 8 inches high, or thereabout, is heavily weighted along its lower edge, so as to float upright in the water; a string, like the belly-band of a kite, and for the same purpose, is fastened to it, and to this belly-band the end of a line, furnished with a dozen hooks, at intervals, is tied. As the fisherman walks along the bank, the otter runs away from him, and carries his line and hooks far out into the stream. It is very convenient to have a large hand-reel to wind and unwind the line upon, but a forked stick will do very well.

In fishing with a long ground-line and many hooks, it is of importance to avoid entanglements; make a box in which to coil the line, and a great many deep saw-cuts across the sides, into which the thin short lines that the hooks are whipped to, are jammed.

To recover a lost line, make a drag of a small bushy tree with plenty of branches, that are so lopped off as to leave spikes on the trunk. This is weighted with a stone and dragged along the bottom.

To see things deep under water, use a long box or tube with a piece of glass at the lower end; this removes entirely the glare of the water and the effects of a rippled surface.



Nets.—A small square net may be best turned to account in this way, sinking it in holes and other parts of a river which fish frequent, throwing in bait to attract them over it, and then hauling up suddenly. A seine net may be furnished with bladder for floats, or else with pieces of light wood charred to make them more buoyant. The hauling ropes may be made of bark steeped for three weeks, till the inner bark separates from the outer, when the latter is twisted into a rope. (Lloyd.) Where the small fish are swimming near the surface in shoals, there the water is sure to be rippled.

§ 2. SPEARING FISH—INTOXICATING THEM.—The “grains” are made much like Neptune’s trident, and the length of the handle gives steadiness to the blow. In spearing by torch-light, a broad oval piece of bark is coated with wet mud, and in it a blazing fire is lighted. It is fixed on a stage, or held in the bow of the boat, so high as to be above the spearman’s eyes. He can see everything by its light, especially if the water be not above 4 feet deep, and the bottom sandy. But there are not many kinds of wood that will burn with a bright enough fire; the dry bark of some resinous tree is often used. If tarred rope can be obtained, it may simply be wound round a pole fixed in the bow of the boat, and lighted.

Intoxicating fish.—Lime kills fish, and the properties of *cocculus Indicus* are well known. Throughout tropical Africa and in South America, the natives catch fish by poisoning them. Dams are made, which, when the river is very low, inclose deep pools of water with no current; into these the poison is thrown; it intoxicates the fish, who float and are taken.

§ 3. OTTERS AND CORMORANTS are both used to catch fish; and dogs are trained by the Patagonians to drive fish into the nets, and to frighten them from breaking loose when the net is being hauled in. Cormorants in China fish from October to May, the winter months, working from 10 A.M. to 5 P.M.; then they are given their dinner. When they fish, a straw tie is put round their neck to keep them from swallowing the fish, and yet so as not to slip down and choke them. A boat takes out ten or twelve of these birds; they obey the voice; if disobedient, the water near them is struck with the back of the oar; as soon as one has caught a fish, he is called to the boat, and the oar is held out for him to step upon.

MEDICINE.

§ 1. Drugs.

§ 2. Diseases.

§ 3. Remedies.

§ 1. DRUGS.—A traveller, unless he be a professed physician, has no object in taking a large assortment of drugs. He wants a few powders, ready prepared, which any physician who knows the diseases of the country where he is about to travel, will prescribe for him. These are as follows: 1. Emetic, mild; 2. ditto, very powerful, for poison (sulphate of zinc). 3. Aperient, mild; 4. ditto, powerful. 5. Cordial for diarrhœa. 6. Quinine for ague. 7. Sudorific (Dover's powder).

It will save infinite trouble with weights and scales if these be all so mixed up that one measure-full of each shall be a full average dose for an adult; and if the measure to which they are adapted be cylindrical, and of such a size as just to admit a common lead pencil, and three-quarters of an inch long, it can at any time be replaced by twisting up a paper cartridge.

In addition to the above powders, the traveller will want cold cream; heartburn lozenges; lint; a small roll of diachylon; lunar caustic, in a proper holder, to touch old sores with, and for snake-bites; a scalpel and a blunt-pointed bistoury, to open abscesses with (the blades of these should be waxed, to keep them from rust); a good pair of forceps, to pull out thorns; a couple of needles, to sew up gashes; waxed thread. A mild effervescing aperient, like Moxon's, is very convenient. Seidlitz powders are perhaps a little too strong for frequent use in a tropical climate.

The medicines should be kept in tin pill-boxes, all of the same diameter, with a few letters punched both on their tops and bottoms, to indicate what they contain, as Emet., Astr., &c.; and the pill-boxes should slip one above another into a long tin box lined with flannel, and lie there like sovereigns in a *rouleau*.

The sulphate of zinc may be invaluable as an eyewash; for ophthalmia is a scourge in many countries, as in parts of North and South Africa, and in Australia. The taste, which should be strongly astringent, is the best guide to the strength of its solution.

For emetics, drink a charge of gunpowder in a tumbler full of warm water, or soap-suds, or even tickle the throat.

Vapour baths are used in many countries, and the Russian plan of making them is the simplest.. They heat stones in the fire, and put them on the ground in the middle of their cabin or tent; on these they pour a little water, and clouds of vapour are given off. The traveller who is chilled or over-worked, and has a quiet day before him, would do well to practise this simple and pleasant remedy.

Ointment.—Simple cerate is equal parts of oil and wax; lard and wax will do.

Seidlitz powders are not often to be met with in the form we are accustomed to take them in, in England; so their receipt is annexed:—

1½ oz. Carbonate of Soda	}	For the blue papers.
3 oz. Tartarised Soda		
7 drachms Tartaric Acid		For the white papers.

These quantities make 12 sets.

§ 2. DISEASES.—Fever of all kinds, diarrhoea, and rheumatism, are the plagues that most afflict travellers; ophthalmia

often threatens them. Change of air, from the flat country up into the hills, as soon as possible after the first violence of the illness is past, works wonders in hastening and perfecting a cure. With a bad diarrhœa, take nothing but broth, and it may be rice, in very small quantities at a meal, until quite restored. The least piece of bread or meat causes an immediate relapse.

The number of travellers that have fallen victims to fever is terrible, and it is a matter of serious consideration whether any motives short of imperious duty could justify a person in braving a fever-stricken country. In the ill-fated Niger expedition, three vessels were employed, of which the "Albert" stayed the longest time in the river, namely, two months and two days. Her English crew consisted of 62 men; of these 55 caught fever in the river, and 23 died. Of the remaining seven, only two ultimately escaped scot-free, the others suffering more or less severely on their return to England. In Dr. McWilliams's medical history of this expedition, it is laid down that the Niger fever, which may be considered as a type of pestilential fever generally, usually sets in sixteen days after exposure to the malaria; and that one attack, instead of acclimatising the patient, seems to render him all the more liable to a second one. Every conceivable precaution had been taken to ensure the health of the crew of the "Albert."

There are certain precautions which should be borne in mind in unhealthy seasons—as never to encamp to the leeward of a marsh; to sleep close in between large fires, with a handkerchief gathered round your face (natural instinct will teach this); not to start off too early in the morning; to avoid unnecessary hunger, hardship, and exposure.

§ 3. REMEDIES.—A half-drowned man must be put to bed in

dry, heated clothes ; hot stones, &c., to his feet ; his head must be raised moderately, and human warmth is excellent, such as that of two strapping men made to lie close up against him, one on each side. All rough treatment is not only ridiculous but full of harm ; such as the fashion, which still exists in some places, of hanging up the body by the feet, that the swallowed water may drain out of the mouth.

For snake-bites, tie a string tight above the part, suck the wound, and caustic it as soon as you can ; or, better, do what Mr. Mansfield Parkyns well suggests, *i.e.* cut away with a knife, and afterwards burn out with the end of your iron ramrod, heated as hot as you can make it. The arteries lie deep, and as much flesh may, without much danger, be cut or burnt into, as the fingers can pinch up. The next step is to use the utmost energy and even cruelty to prevent the patient's giving way to that lethargy and drowsiness which is the usual effect of snake poison, and too often ends in death.

Stretcher.—For description of a stretcher to carry wounded people, see page 85.

Excessive bleeding.—When the blood does not pour or trickle in a steady stream from a deep wound, but in pulses, and is of a bright red colour, all the bandages in the world will not stop it. It is an artery that is wounded, and unless there be some one accessible who knows how to take it up and tie it, I suppose that the method of our forefathers can alone be used by an unskilled traveller ; this is, to burn deeply into the part, as you would for a snake-bite ; or else to pour boiling grease into the wound. It is, of course, a barbarous treatment, and far from being sure of success, as the cauterised artery may break out afresh ; still life is in question, and it is the only hope of saving it. After the cautery, the wounded man's limb should be kept perfectly

still, and well raised, and cool, until the wound is nearly healed. A *tourniquet*, which will stop the blood for a time, is made by tying a strong thong, string, or handkerchief, firmly above the part, putting a stick through and screwing it tight. If you know whereabouts the artery lies which it is the object to compress, put a stone over the place and under the handkerchief. The main arteries follow pretty much the direction of the inner seams of the coat sleeves and trousers.

To cure blistered feet.—"Rub the feet at going to bed with spirits mixed with tallow dropped from a candle into the palm of the hand; on the following morning no blister will exist. The spirits seem to possess the healing power, the tallow serving only to keep the skin soft and pliant. This is Captain Cochrane's advice, and the remedy was used by him in his pedestrian tour." (Murray's "Hand-Book to Switzerland.") The receipt is excellent, and cannot be too widely known. To prevent the feet from blistering, it is a good plan to soap the inside of the stocking before setting out; and a raw egg broken into a boot before putting it on greatly softens the leather.

After some hours' walking, when the feet are beginning to be chafed, take off the shoes and change the stockings, putting what was the right stocking on the left foot, and the left stocking on the right foot.

Rarefied air.—On high plateaux or mountains, travellers must expect to suffer somewhat. The symptoms are described by many South American travellers; the attack of them is there, among other names, called the *puna*. The disorder is sometimes fatal to stout plethoric people; oddly enough, cats are unable to endure it. At villages 13,000 feet above the sea, Dr. Tscudi says that they cannot live. Numerous trials have been made, but the creatures die in frightful convulsions.

The symptoms of the puna are giddiness, dimness of sight and hearing, headache, fainting-fits, blood from mouth, eyes, nose, lips, and a feeling like sea-sickness. Nothing but time cures it. It begins to be felt at from 12,000 to 13,000 feet above the sea.

Scurvy has attacked travellers in Australia. Any vegetable diet cures it. Lime-juice, treacle, raw potatoes, and acid fruits are especially efficacious.

Teeth.—Tough diet tries the teeth so severely that a man about to undergo it had much better pay a visit to a dentist before he leaves England. It appears that an unskilled traveller is very likely to make a bad job of a first attempt at tooth-drawing. By constantly pushing and pulling an aching tooth it will in time loosen, and perhaps, after some weeks, come out.

Suffering from thirst.—Pour water over the clothes of the man, and keep them constantly wet, restrain his drinking, after the first few minutes, as much as you can summon heart to do so. In less severe cases drink water with a tea-spoon; it will satisfy a parched palate as much as if you gulped it down in tumblers-full, and will disorder the digestion very considerably less.

Suffering from hunger.—Two or three mouthfuls every quarter of an hour is, to a man in the last extremity, the best thing; and strong broth is the best food.

Wasp and scorpion stings.—The oil scraped out of a tobacco-pipe is good; should the scorpion be large, his sting must be treated like a snake-bite (p. 222).

Poisoning.—The first thing is to give a powerful emetic, to throw up whatever poison may still remain unabsorbed in the stomach. Use soap-suds or gunpowder (p. 220) if proper emetics are not at hand. If there be violent pains and

gripings, or retchings, give plenty of water to make the vomitings more easy. Nothing now remains to be done but to resist the symptoms that are caused by the poison which was absorbed before the emetic acted. Thus, if the man's feet are cold and numbed, put hot stones against them, and wrap him up warmly. If he be drowsy, heavy, and stupid, give brandy, and try to rouse him. There is nothing more to be done, save to avoid doing mischief.

Bleeding.—Physicians say, now-a-days, that bleeding is rarely, if ever, required, and that frequently it does much harm.

Fleas.—"Italian flea-powder," sold in the East, is said to be really efficacious, and there is a plant, "Piré outoum," mentioned in Curzon's Armenia, as growing in that country, and which is powdered and sold as a specific. It may or may not be the same thing as this "Italian" powder.

Vermin on the person.—"We had now been travelling for nearly six weeks, and still wore the same clothing we had assumed on our departure. The incessant pricklings with which we were harassed, sufficiently indicated that our attire was peopled with the filthy vermin to which the Chinese and Tartars are familiarly accustomed, but which, with Europeans, are objects of horror and disgust.

"Before quitting Tchagan-Kouren, we had bought in a chemist's shop a few sapeks-worth of mercury, We now made with it a prompt and specific remedy against the lice. We had formerly got the receipt from some Chinese, and as it may be useful to others, we think it right to describe it here. You take half an ounce of mercury, which you mix with old tea-leaves previously reduced to paste by mastication. To render this softer, you generally add saliva; water could not have the same effect. You must afterwards bruise and

stir it a while, so that the mercury may be divided into little balls as fine as dust. (I presume that blue pill is a pretty exact equivalent to this preparation.) You infuse this composition into a string of cotton, loosely twisted, which you hang round the neck; the lice are sure to bite at the bait, and they thereupon as surely swell, become red, and die forthwith. In China and in Tartary you have to renew this salutary necklace once a month." (Huc's "Travels in Tartary.")

Travellers are apt to expect too much from medicine, and to think that savages will hail them as demi-gods wherever they go. But their patients are generally cripples who want to be made whole in a moment, and other such like impracticable cases. Powerful emetics, purgatives, and eyewashes are the most popular physickings.

Let him who is sick, away from help, console himself with the proverb, that "though there is a great difference between a good physician and a bad one, there is very little between a good one and none at all."

PRESENTS, AND ARTICLES FOR PAYMENT AND EXCHANGE:

It is of the utmost importance to a traveller to be well and judiciously supplied with these; they are his money, and without money a person can no more travel in Savagedom than in Europe. It is a great mistake to suppose that savages will give their labour or cattle in return for anything that is bright or new; they have their real wants and their fashions as much as we have, and unless what a traveller brings satisfies the one or the other, he can get nothing from them except through fear or compulsion.

The necessities of a savage are soon satisfied, and unless he belongs to a nation civilised enough to live in permanent habitations, and secure from plunder, he cannot accumulate, but is only able to keep what he actually is able to carry about his own person. Thus, the chief at lake Ngami told Mr. Andersson that his beads would be of little use, for the women about the place already "grunted like pigs" under the burdens of those that they wore, and which they had received from previous travellers. These are matters of serious consideration to persons who propose to travel with a large party, and who must have proportionably large wants.

Speaking of presents and articles for payment, as of money, it is essential to have a great quantity and variety of *small change*, wherewith the traveller can pay for small services, for carrying messages, for draughts of milk, pieces of meat, &c. Beads, shells, tobacco, needles, awls, cotton caps, handker-

chiefs, clasp-knives, small axes, spear and arrow heads, generally answer this purpose.

There is infinite fastidiousness shown by savages in selecting beads, which, indeed, are their jewellery; so that valuable beads, taken at hap-hazard, are much more likely to prove failures than not. It would always be well to take abundance (40 or 50 lbs. weight goes but a little way) of the following cheap beads as they are very generally accepted—dull white, dark blue, and vermilion red, all of a small size.

It is the ignorance of what are the received articles of payment in a distant country, and the using up of those that are taken, which, more than any other cause, limits the journeyings of an explorer, and the demands of each fresh chief are, of themselves, an immense drain upon his store.

CHAPTER OF ESTIMATES.

As a guide towards estimating the probable duration of a journey, experience shows that 10 English miles per day, measured along the road, or, what is much the same thing, 6 geographical miles, measured with a pair of compasses from point to point, is, taking one day with another, and including all stoppages of every kind, whatever be their cause, very fast travelling for the same caravan; and in arranging an outfit for an exploring expedition, not more than half that speed should be reckoned upon. Indeed, it would be very creditable to conduct the same caravan 1000 geographical miles across a rude country in six months.

For shorter distances, tricks may be played with the cattle. The pace of a caravan across average country is $2\frac{1}{2}$ miles per hour, or 2 geographical miles, as measured with the compasses from point to point, and not following the sinuosities of each day's course; but every minute lost in stoppages by the way must be recorded, and subtracted from the whole time spent on the road. A careful traveller will be surprised at the accuracy of the results obtainable in this way. These data have no reference to a journey which may be undertaken at a dash, or to one where the watering places and pasturages are well known; but to one of considerable length, in which a traveller must feel his way, and where he must use every caution not to exhaust his cattle, lest there should be an unexpected call for exertion which they might prove unequal to meet.

But persons who have never travelled, and very many of those who have, from neglect in analysing what has actually been performed by them, entertain most erroneous views on these matters.

Outfit.—To make an expedition effective, it is not possible to contrive any large reduction in the detailed list that is appended to the close of the chapter, which, on the other hand, omits no object of any real importance, having been gone over very carefully. The result of the estimates is this, —that to know what is the minimum weight that has to be carried by an expedition in rude countries, where nothing except solid food and water can ever be obtained, we must fill up the following formula, and add the whole together:—

FORMULA.

	lbs.
Stores for common use, not articles of consumption, and therefore to a great degree independent both of the number of the party and of the time reckoned on for the expedition (the details are given, p. 232, 3, 4, under the heads of Various, 95 lbs.; Stationery, 30 lbs.; Mapping, 31 lbs.; Natural History, 30 lbs.; leaving a margin for extras of 14 lbs.)	200
Stores for the white men of the party, not articles of consumption, as clothes, bedding, share of cooking things, and those rations of water and food that have always to be carried from stage to stage, whatever the extent of the journey may be; 60 lbs. weight for each white man (p. 234)	
Allowance of articles of consumption to the white men of the party, viz. salt, tea, coffee, tobacco, powder, shot, &c.; 8 lbs. per month to each white man (p. 235)	
Stores for the black men of the party, not articles of consumption, as described above; 30 lbs. weight for each black man (p. 235)	
Allowance of articles of consumption to the black men of the party, viz. salt, coffee, presents, &c.; 3 lbs. per month to each black man (p. 236)	
Extras, viz.:—	

Those pack-saddles that are carried in the waggon as a reserve,

	lbs.
including girths, straps, large leather bags for stowing the articles in, and mackintosh overall to keep the pack dry; 30 lbs. each	
Water tanks, 40 lbs. each (p. 16)	
Water kegs, 15 lbs. each (p. 14)	
Heavy ammunition (1 lb. weight gives 10 shots)—otherwise each armed man is supposed to carry a long double-barrelled rifle of very small bore, say 70, and ammunition for these is allowed for above	
Presents, from 50 lbs. to, it may be, 300 lbs., or more (p. 227)	
Total weight necessary to be carried	_____
Special extras, as actually weighed, not estimated	_____
Total	_____

If meat and bread have to be carried, the burden is enormously increased, for each man's daily ration of these things weighs 3 lbs.; but *see* p. 76 for lighter kinds of food.

Slaughter animals carry themselves; however, their cattle-watchers swell the list of those that have to be fed.

Now to transport this weight of things across a wild and unknown country, we estimate that—

	lbs.
An ass will not carry more than about (<i>net weight</i>)	65
A small mule	90
A horse	100
An ox of an average breed	120
A camel (who rarely can be used by an explorer; <i>see</i> p. 159)	300

It is very inconvenient to take more than six pack animals in one caravan that has to pass over broken country, or so much time is lost in re-adjusting packs, that its progress is seriously retarded.

An animal, camels always excepted, will draw upon wheels about two and a half times the weight he will carry.

	lbs.
A light cart, exclusive of the driver, should not carry more than . . .	800
A light waggon, such as one or two horses would trot with along a turnpike road, not more than	1500
A waggon of the strongest construction, not more than	3000

A fair estimate in commissariat matters is as follows:—

A strong waggon full of food carries 1000 full-day rations.	
A slaughter ox yields, <i>as fresh meat</i>	80
A fat sheep yields	10
The pack of an ox carries	40
The pack of a horse „	30

N.B. Meat when jerked loses about one-half of its nourishing powers.

LIST OF SUPPLIES, WITH THEIR WEIGHTS, THAT HAVE TO BE
CARRIED BY AN EXPEDITION IN A COUNTRY THAT YIELDS
NOTHING BUT OCCASIONAL SUPPLIES OF MEAT AND WATER.

STORES FOR COMMON USE.

VARIOUS—

	lbs.
One or two very small, soft-steel axes; a small file to sharpen them; a few additional tools (<i>see</i> p. 135); spare butcher's knives	8
A dozen awls for wood and for leather, two of them in handles; two gimlets; a dozen sail needles; three palms; a ball of sewing- twine; bit of bees' wax; sewing needles, assorted; a ball of black and white thread; buttons; two tailor's thimbles . . .	3
Two penknives; small metal saw; bit of Turkey hone; large scissors; corkscrew	1½
Spring balances, from ¼ lb. to 5 lbs., and from 1 lb. to 50 lbs. (or else a hand steelyard)	1½
Carried forward	14

	lbs.
Brought forward	14
Fish-hooks of many sorts; cobbler's wax; black silk; gut; two or more fishing-lines and floats; a large ball of line; thin brass wire, for springes	2
Ball of wicks, for lamps; candle mould; a few corks; lump of sulphur; amadou	1½
Medicines (<i>see</i> p. 219); a scalpel; a blunt-pointed bistoury; and good forceps for thorns	1
A small iron, and an ironing flannel; clothes-brush; bottle of scouring-drops	3
Bullet-mould, not a heavy one; bit of iron plate for a ladle	0½
Gun-cleaning apparatus; turnscraws; nipple-wrench; bottle of fine oil; spare nipples	2
Two mackintosh water-bags, shaped for the pack-saddle, of one gallon each, with funnel-shaped necks, and having a wide mouth (empty)	2½
Composition for mending them, in two small bottles; and a spare piece of mackintosh	0½
Spare leather, canvas, and webbing, for girths; rings and buckles	20
Two small patrol tents, poles, and pegs (p. 46, &c.)	30
Small inflatable pontoon for one, or even two, men (p. 108)	10
Small bags for packing the various articles, independently of the saddle-bags	4
Mackintosh sheeting overall, to keep the pack dry	4
	<hr/>
	95
	<hr/>

STATIONERY—

Two ledgers; a dozen metallic note-books; paper	5
Inks; pen; pencils	2½
Board to write upon	2
Books to read, say equal to six vols. the ordinary size of novels; and maps	7½
Bags and cases	3
Sketching-books, colours, and pencils	6
	<hr/>
	30
	<hr/>

MAPPING INSTRUMENTS (see following Chapter, p. 199)—

	lbs.
Two sextants; horizon and roof; lanthorn; two pints oil; telescope for occultations; thermometers; watches; stand for either sextants or telescope	18
Protractors; ruler; compasses; measuring-tape, &c.	3
Raper's Navigation; Nautical Almanack; small tables, and small almanacks; star maps	4
Bags and baskets, well wadded	6
	<hr/>
	31

NATURAL HISTORY (for an occasional collector)—

Arsenical soap, 2 lbs.; camphor, $\frac{1}{2}$ lb.; pepper, $\frac{1}{2}$ lb.; bag of some powder to absorb blood, 2 lbs.; tow and cotton, about 10 lbs.; scalpel, forceps, scissors, &c., $\frac{1}{2}$ lb.; sheet brass, stamped for labels, $\frac{1}{2}$ lb.	16
Pill-boxes; cork; insect-boxes; pins; tin, for catching, and keeping, and killing, animals; nets for butterflies; (say, bags and all)	10
Geological hammers, &c.	4
	<hr/>
	30

(I make no allowance for the weight of specimens, for these accumulate as stores are used up, and seldom in a faster proportion.)

PRESENTS, AND ARTICLES FOR PAYMENT AND EXCHANGE—

They are usually of far greater weight than all the above things put together; 100 lbs. weight of beads does not go far in Africa. Tobacco is the lightest and most generally-prized article of any.

WEIGHT OF STORES, NOT ARTICLES OF CONSUMPTION, FOR EACH WHITE MAN OF THE PARTY—

	lbs.
Clothes (see list, p. 57); mackintosh rug; ditto sheet; blanket-bag; spare blanket	30
Share of plates, knives, forks, spoons, pannikins, or bowls	2
	<hr/>
Carried forward	32

	lbs.
Brought forward	32
Share of cooking things, iron pots, kettles, &c.	3
Spare knife, flints, steel, tinder-box, tinder, four pipes	2
Reserve :—	
Five days of jerked meat, at 3 lbs. a day (on an average)	15
Two quarts of water (on average), 4 lbs. ; share of kegs, 4 lbs.	8
	<hr/>
	60
	<hr/>

(These are not properly “ articles of consumption,” as they have to be carried in reserve whatever the length of the journey may be.)

ARTICLES OF CONSUMPTION, CALCULATED FOR A SIX MONTHS JOURNEY, FOR EACH WHITE MAN—

	lbs.
Tea and coffee, 9 lbs. ; tobacco, 6 lbs. ; salt, 6 lbs. ; pepper, 1 lb.	22
Brandy or rum occasionally served out	6
White sugar, 2 lbs. ; arrowroot, 1 lb. ; dried onions, &c., 3 lb.	6
About 200 rounds of ammunition to American rifles, 70 bore, with reserve powder and caps, <i>i. e.</i> Minié bullets, ready cast in spelter, 5 lbs. ; powder, 3 lbs. ; 400 caps ; thin calico for patches, 1 lb.	9
Bags, 6 lbs.	6
	<hr/>
(Or at the rate of 8 lbs. per month.)	49
	<hr/>

STORES, NOT ARTICLES OF CONSUMPTION, FOR EACH BLACK MAN—

	lbs.
Bedding, &c.	9
Meat and water, as above (about)	19
Share of cooking things	2
	<hr/>
	30
	<hr/>

ARTICLES OF CONSUMPTION, CALCULATED FOR SIX MONTHS, FOR
EACH BLACK MAN—

Tobacco, 6 lbs. ; salt, pepper, &c., 5 lbs.	11
Presents which will have to be made him from time to time	6
	<hr/>
(Or at the rate of 3 lbs. per month.)	17
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INSTRUMENTS

FOR TAKING OBSERVATIONS AND DRAWING UP A MAP.

§ 1. Outfit.

§ 2. Substitutes for Instruments.

§ 1. OUTFIT.—It will add greatly to the interest which a traveller may take in drawing up a large and graphic route map of his journey, to be assured of the extreme ease and cheapness with which copies of such a map may be multiplied to any extent by a well-known process in lithography; since these being available for distribution among persons interested in the matter, will prevent his painstaking from being lost to the world.

The method I refer to is that of autographic ink and paper; they can be obtained, with full instructions, at any lithographer's shop. The paper is prepared by being glazed over with a composition, and the ink is in appearance something like Indian ink, and used in much the same way. With a pen and this ink, and upon this paper, the traveller draws his map; they are neither more nor less difficult to employ than common stationery, and he may avail himself of tracing-paper without danger. He has one single precaution to guard against, which is, not to touch the paper overmuch with his bare hand, but to keep a bit of loose paper between it and the map as he draws.

As soon as finished, the map is taken to the lithographer, who puts it face downwards on a stone, and passes it under his press, when every particle of ink leaves the surface of the paper, and attaches itself to the surface of the stone precisely as though it had originally been written there : the glaze on the paper, which prevents the ink from soaking into it, makes this transference more easy and complete.

The stone can now be worked with, just as a stone that has been regularly lithographed ; that is to say, printing-ink may be rubbed over it, and impressions taken off to any amount. It will be observed that the writing on the paper comes off reversed upon the stone, and is re-reversed, or set right again, in the impressions that are taken from it.

The lithographer's charges for furnishing autographic ink and paper, working the stone, striking off fifty copies of a folio size, and supplying the paper (common white paper) for the copies—in fact, every expense included—need not exceed ten shillings, and may be much less.

If, before drawing out his map, the traveller were to go to some working lithographer, and witness the process, and make two or three experiments in a small way, he would naturally succeed all the better. A map drawn on a large scale, though without any pretension to artistic skill, with abundance of profile views of prominent landmarks, and copious information upon the routes that were explored, written along their sides, would be of the utmost value to future travellers, and to geographers at home.

I reprint here part of a short paper that I have communicated to the Royal Geographical Society, and which will be found at the end of their volume for 1854. In addition to it, communications are also published there from Lieutenant

Raper, Captain Fitzroy, Admiral Smith, Admiral Beechey, and Colonel Sykes; the whole being collected under the title of "Hints to Travellers."

My own object was to suggest a complete and efficient outfit of *simple instruments* to explorers; to which end I gave the following list. I must, however, premise that I am ignorant of the merits of the many instruments lately designed by the Astronomer Royal of Scotland to supersede the sextants, &c., in common use.

LIST OF INSTRUMENTS.

A SEXTANT—

A sextant of five-inch radius, light in weight, by a first-rate maker divided clearly, and on platinum, to quarter degrees. It must have a ground-glass screen fixed in front of the reading-off lens, to tone down a glaring light, and a coloured glass to screw on to the telescope for index error purposes, in addition to the coloured shades.

The handle must be adapted for fixing on the telescope stand.

(It is recommended by Admiral Beechey that the traveller's sextant should be on a plan which will measure accurately *any* angle, and that its telescope should have a horizontal line in its focus, and be fitted with a spirit-level, after the manner of levelling instruments; for when so fitted and screwed to a stand, altitudes of hills, and of stars when low, may be observed with it.)

A sextant of three-inch radius, graduated boldly to half degrees, in a leather case, like that of an azimuth compass, suitable for slipping on to a leather belt and being worn round the waist, if required.—Reserve, a second five-inch sextant, or other angular instrument of whatever kind the traveller may wish to take.

ARTIFICIAL HORIZON—

The trough must not be less than $3\frac{1}{2}$ inches, inside length; it must be of the usual construction for filtering the mercury when it is poured

in. The glass screen must be a folding one, and by a first-rate maker.—Reserve, one spare glass and a strong two-ounce glass bottle full of mercury, wrapped up loosely in a roll of clothes, and well tied up and labelled.

(The trough should rest on a metal plate, the size of a thin octavo book, with three knobs of an inch long for legs; this gives a steady rest when the ground is uneven, and raises it above the grass, &c. Dark or inky water will do nearly as well as mercury.—*Report of Sub-Committee.*)

WATCH—

A common, strong, silver watch, not too heavy, with an open face and a second-hand; it must wind up at the back. The hands should be black steel, not gilt, and they and all the divisions should be very clear and distinct. The performance of the watch is really a very secondary matter. 4*l.* is quite enough to give for it.—Reserve, at least two other watches of the same character; these should be rolled up separately, each in a loosely-wrapped parcel of dry clothes, say of old stockings, and they will never come to harm: they should be labelled, and rarely opened. Half a dozen spare watch glasses, fitting easily; two to each watch. Three spare watch-keys; one might be tied to the sextant-case, one wrapped up with each watch.

COMPASS—

An azimuth compass, graduated from 0° to 360°; and if the maker understands how to do it, have a shield of brass cut out here and there, to admit light, fixed over the glass.—Reserve, two spare glasses and a second azimuth compass.

Three common pocket compasses, from an inch to an inch and a half in diameter. Their needles must carry cards graduated, like those of the azimuth compass, from 0° to 360°, in addition to the points. These compasses should be very light in weight, have plenty of depth, and be furnished with catches. The needles should work steadily and quickly. Avoid one that makes long, slow oscillations. (*See p. 125.*)

TELESCOPE—

One of 2 $\frac{3}{4}$ -inch object-glass, for observing occultations of small stars, and eclipses of Jupiter's satellites. The buyer should test it on the

satellites, and be himself satisfied of its power before concluding the bargain.

STANDS—

A clamp, to screw into a tree or a block of wood for the purpose of holding the telescope or sextant; one with three legs is perfectly useless to a traveller, for he has no table or anything else to put it on.

The ordinary telescope clamp makes a very good rest for a sextant, by clamping a rod of wood, one end of which is weighted as a counterpoise, and the other, ending in a neck, is pushed through an auger-hole in the sextant handle, with a linch-pin stuck through its projecting end. Smooth action is not at all wanted for a sextant-rest.

THERMOMETERS—

Two boiling-point thermometers. (Try them yourself against a good barometer to learn their index errors, at least; and recollect that for all purposes of determining heights, common water does just as well as distilled water.)

Two or three common thermometers, graduated to 160° at least, if for hot climates.

A pot arranged to boil the thermometer in.

LANTERN—

I can only suggest a "bull's-eye," which was what I used: I wish I knew of a better. A small ball of spare wick. Abundance of lamp-oil.

MAPPING INSTRUMENTS—

Protractors—1 large circular brass one, 4 or 5 inches in diameter; 2 semicircular brass ones of $3\frac{1}{2}$ inches; all graduated, like your compasses, from 0° to 360° , and not twice over to 180° .

A station pointer for protracting sextant angles.

Two or three rulers, of 1 foot each, in ivory; a small square; a set of scales; small parallel rulers; compasses with pencil and pen; small pair of reserve compasses; fine ruling pen; a dozen artists' pins. Medium-size measuring-tape, say 12 yards; pocket ditto, 2 yards.

ADDITIONAL INSTRUMENTS, NOT NECESSARY, BUT CONVENIENT—

A pedometer of the best construction.

An Adie's sympiesometer.

I can hardly recommend an explorer to have anything to do with either a chronometer or a mountain barometer.

STATIONERY—

A light board of the very best mahogany, to rule and draw upon, as large as the writing-case will hold, say 11 inches by 7.

Plenty of metallic note-books, with spare pencils, all of one size, say 5 inches by $3\frac{1}{2}$, or larger, with a leather pouch, having a flap buttoning easily over, and sewn on to the belt, to hold the one in use.

Two (or three) ledgers of strong ruled paper, 11 inches by 7, each with a leather binding; the pages should be numbered, and journal observations, agreements, sketches, and every single thing that is written, written in them.

Plenty of spare paper; it should be smooth, sufficiently thick, and fold up into 11 inches by 7.

A sheet of blotting-paper cut up and put here and there in the ledgers.

Tracing-paper, both black and transparent.

Blank Map ruled for latitude and longitude.

Two dozen steel pens and holders; half a dozen fine drawing and holder; half a dozen FH pencils; half a dozen HB ditto.

Two penknives; India-rubber cut up in 5 or 6 bits.

Ink-powders (in default of vinegar, use plain water). Red ink.

Paints, one cake or half a cake of each—viz. Indian ink, lake, cobalt, gamboge, ox-gall—in a small tin case.

Half a dozen common paint brushes, one or two of which are kept in the case.

Books—

Raper's Navigation.

Nautical Almanack for current and future years, well bound.

Tables of Logarithms of Society of Useful Knowledge, well bound.

Tables for boiling-point thermometers.

Celestial Maps (uncoloured), pasted on canvas (and learn how to use them).

Three or four small 6d. or 1s. almanacks of any kind ; the Nautical is far too cumbrous and on too bad paper for daily use (Hannay and Dietrichsen's gives a vast deal of information ; the Seaman's Almanack, White's Ephemeris, &c. ; they are all useful to select and cut tables out of).

The best maps of the country you are going to that are to be got.

§ 2. SUBSTITUTES FOR INSTRUMENTS.—A horse, whether walking or trotting, takes pretty nearly 1000 steps to a mile, so that if your route map be on the scale of an inch to the mile, 100 of his paces will be represented by the tenth of an inch. The habit of counting paces in a mechanical way is soon acquired by a traveller, who should make use of a rosary of beads to record them, shifting a bead from one side to the other after each 100 paces ; then, if every tenth bead be a large one, it will represent a mile.

A traveller, when the last of his watches breaks down, has no need to be disheartened from going on with his longitude observations, especially if he observes occultations and eclipses. The object of a watch is to tell the number of seconds that elapse between the instant of occultation, eclipse, &c., and that, a minute or two later, when the sextant observation for time is made ; and all that it actually *does*, is to beat seconds and to record the number of beats. Now, a string and stone swung as a pendulum will beat time ; and a native who is taught to throw a pebble into a bag at each beat will record it ; and for operations that are not tedious, he will be as good as a watch. The rate of the pendulum is, of course, determined by taking two sets of observations, with three or four minutes' interval between them ; and if the distance from the point of suspension to the centre of the stone be 39 inches, and if the string be thin and the stone very heavy, it will beat seconds very nearly indeed.

Units of length.—Pacing should be practised, and also spanning, and fathoming with outstretched arms. It is well to dot a scale of inches on the gun-stock and pocket-knife.

Angles, to measure.—I find that a capital substitute for a very rude sextant is afforded by the outstretched hand and arm. The span between the middle finger and the thumb subtends an angle of 15° , and that between the forefinger and the thumb an angle of $11\frac{1}{4}^\circ$, or one point of the compass. Just as a person may learn to walk *yards* accurately, so may he learn to span out these angular distances accurately; and the horizon, however broken it may be, is always before his eyes to check him. Thus, if he begins from a tree, or even from a book on his shelves, and spans all round until he comes to the tree or book again, he should make twenty-four of the larger spans and thirty-two of the lesser one. These two angles of 15° and $11\frac{1}{4}^\circ$ are particularly important. The sun travels through 15° in each hour, and therefore, by “spanning” along its course, as imagined, from the place where it would stand at noon (aided in this by the compass), the hour before or after noon, and, similarly, after sunrise or before sunset, can be instantly reckoned. Again, the angles 30° , 45° , 60° , and 90° , all of them simple multiples of 15° , are by far the most useful ones in taking rough measurements of heights and distances, because of the simple relations between the sides of right-angled triangles whose other angles are 30° , 45° , &c. As regards $11\frac{1}{4}^\circ$, or one point of the compass, it is perfectly out of the question to trust to bearings taken by the unaided eye, or to steer a steady course by simply watching a star or landmark, when this happens to be much to the right or the left of it. Now, nothing is easier than to span out the bearing from time to time.

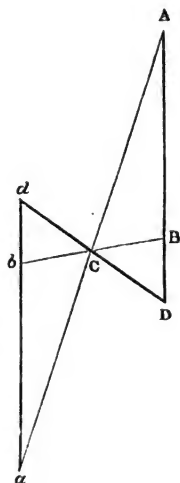
Squaring.—As a triangle whose sides are as 3, 4, and 5,

must be a right-angled one (since $5^2 = 3^2 + 4^2$), we can always find a right angle very simply by means of a measuring tape. We take a length of 12 feet, yards, fathoms, or whatever it may be, and peg the two ends of it, close together, to the ground. Next a peg is driven in at the third division, and then the third peg is held at the twelfth division of the cord, which is stretched out till it becomes taut, and the peg is driven in. These three pegs will form the corners of a right-angled triangle.

Measurements, &c.—To show how the breadth of a river may be measured without instruments and without crossing it, I have taken the following useful problem from the French “*Manuel du Génie.*” I may remark that those usually given by English writers for the same purpose are, strangely enough, unsatisfactory, for they require the measurement of an angle. This plan requires pacing only.

To measure AB , produce it any distance to D ; from D , in any direction, take any equal distances, DC , CD , and produce BC to b , making $cb = CB$; join db and produce it to a , where AC produced intersects it; then ab is equal to AB . In practice, the points DC , &c., are marked by bushes planted in the ground, or by men standing.

Sun-dial.—Fix, as you best can, a rod or the edge of a plank so as to point exactly to the Pole—to the North Pole in the north hemisphere, to the South Pole in the south one. This is the one essential point of dial-making, because it ensures that the shadows shall fall in the



same direction at the same hours all the year round. As to knowing where to mark the hour lines on the ground, or wall, on which the shadow of the rod falls, it is best to use a watch or whatever makeshift means of reckoning time be at hand. Calculations are too troublesome, unless the plate is quite level, or vertical, and exactly facing South or North, or else in the plane of the Equinox.

Signals.—See p. 121.

Sound flies at 380 yards a second in round numbers; it is easy to measure rough distances by the flash of a gun and its report, for even a storm of wind only makes 4 per cent. difference in its speed one way or the other.

Compasses.—See p. 125.

Alphabetical lists.—Every explorer has frequent occasion to draw up long catalogues in alphabetical order, whether of words for vocabularies, or of things that he has in store; now there is a right and a wrong way of setting to work to make them. The *wrong way* is to divide the paper into equal parts, and to assign one of them to each letter in order. The *right way* is to divide the paper into parts of a size proportionate to the number of words in the English language which begin with each particular letter. In the first case, the paper will be overcrowded in some parts and utterly blank in others; in the second, it will be equally overspread with writing; and an ordinary sized sheet of paper, if closely and clearly written, will be sufficient for the drawing up of a very extended catalogue. A convenient way of carrying out the principle I have indicated, is to take an English dictionary, and after having divided the paper into as many equal parts as there are leaves in the dictionary, to adopt the first word of each leaf as headings to them. It may save trouble to my readers if I give a list of headings appropriate to a small catalogue. We will

suppose the paper to be divided into fifty-two spaces—that is to say, into four columns, and thirteen spaces in each column—then the headings of these spaces, in order, will be as follows:—

A	dul	pal	son
adv	eve	per	sta
app	fin	ple	str
bal	gin	pre	sur
bil	hee	pro	tem
bre	imp	que	tos
cap	int	rec	tur
chi	k	reg	unb
col	lan	ris	une
com	mac	sab	ven
cra	mil	sea	wea
dec	nap	sha	wor
dis	off	siz	x y z

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